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FINAL FIELD OPERATIONS PLAN
INTERIM FIELD INVESTIGATION

GREENWOOD CHEMICAL COMPANY SITE
ALBEMARLE COUNTY, VIRGINIA
AUGUST, 1987

300005

EBASCO SERVICES INCORPORATED

EBASCO

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August 27, 1987
RM/III/87-0253
Response Required

Mr. Darius Ostrauskas
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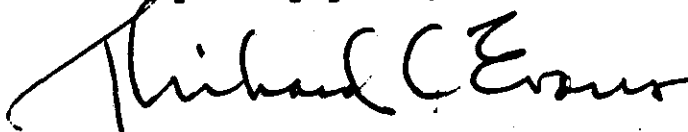
Subject: REM III PROGRAM - EPA CONTRACT NO. 68-01-7250
EPA WORK ASSIGNMENT NO. 136-3LP5
GREENWOOD CHEMICAL SITE, ALBEMARLE COUNTY, VA
FINAL FIELD OPERATIONS PLAN
INTERIM FIELD INVESTIGATION

Dear Mr. Ostrauskas:

The REM III Team is pleased to submit this Final Field Operation Plan for an Interim Field Investigation. This report has been prepared in accordance with Work Assignment Number 135-3LP5 Amendment No. 1. It incorporates comments from EPA transmitted via your August 18, 1987 letter and telecons with the Site Manager, Mr. John F. Gorgol.

If you have any questions regarding this submittal, please feel free to call me or Mr. John F. Gorgol.

Very truly yours,



Richard C. Evans, P.E.
Regional Manager, Region III

RCE/JFG/cdm

Attachment

cc: Mr. A. Ferdas EPA Region III
Dr. M. Yates ZPMO
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Mr. J. Gorgol Ebasco

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AUGUST 1987

FINAL FIELD OPERATIONS PLAN

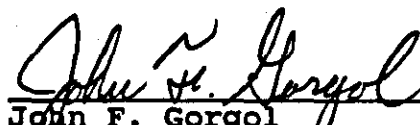
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ALBEMARLE COUNTY, VIRGINIA

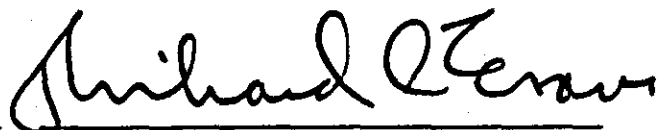
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UNDER
CONTRACT NUMBER 68-01-7250

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**FINAL FIELD SAMPLING AND ANALYSIS PLAN
INTERIM FIELD INVESTIGATION**

**GREENWOOD CHEMICAL COMPANY SITE
ALBEMARLE COUNTY, VIRGINIA**

AUGUST 1987

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1.0 INTRODUCTION

This document presents the Field Sampling and Analysis Plan (FSAP) for the Interim Field Investigation to be undertaken by Ebasco Services Incorporated (Ebasco) at the Greenwood Chemical Company site. Completion of a separate Work Plan and Site Management Plan (SMP) was not justified for this Interim Field Investigation because of the limited scope of activities associated with this initial field effort and the objectives of the effort are not to support a full Remedial Investigation and Feasibility Study (RI/FS). However, in addition to presenting the specific sampling and analysis procedures this FSAP has been expanded to include key information normally presented in Work Plans and SMP's. The additional or expanded sections include: Objectives of the Interim Field Investigation, Summary of Existing Data, Risk Assessment Models for Development of Remedial Action Levels, Project Organization and Personnel Requirements and Mobilization Activities.

The Interim Field Investigation will be performed in two phases in order to collect the necessary data in a cost effective, timely and safe manner. The majority of the interim field sampling will be completed during Phase I which will commence as soon as possible following appropriation of funds. Phase II sampling will consist of sampling of soil under the lagoons and under the buried drums. These areas will be sampled following the initial excavation of lagoon sludges and buried drums during the removal action planned for the site.

It is anticipated that an RI/FS Work Plan, FSAP and SMP will be prepared following completion of the Interim Field Investigation.

1.1 OBJECTIVES OF THE INTERIM FIELD INVESTIGATION

The purpose of the Interim Field Investigation is to provide support for planning and executing a removal action at the Greenwood Chemical Site involving excavation and staging, and possibly treatment, of buried drums and lagoon contents. Rem III support for a possible removal action presently addresses the following three areas:

1. Development of remedial action levels for on-site soils to define possible excavation depths.
2. Design of a sampling plan which, when executed, can verify attainment of remedial action levels.
3. Improve estimates of total waste volumes requiring excavation and perform tests to initially evaluate incineration as an alternative for treating waste materials from the site.

The manner in which the FSAP addresses each of these areas is described below.

The Interim Field Investigation supports the development of remedial action levels for on-site soils by providing all input data needed to perform risk assessments for the site. The site risk assessments will be the basis for establishment of the remedial action levels. Risk assessment pathways include groundwater, surfacewater (stream and farm ponds), air, soil contact and soil ingestion. A description of each of these pathways, and risk assessment models which will be used for each, is included in section 1.4. In addition to the establishment of a complete list of contaminants for each pathway, there are other site specific data required to perform the site risk assessment. These data needs are described in Section 1.4 and Section 3.

In order to design an optimum sampling plan to verify attainment of remedial action levels, a complete list of the contaminants of concern and an estimate of the variability of contaminant concentrations within the site soil media is required. The Interim Field Investigation addresses these needs.

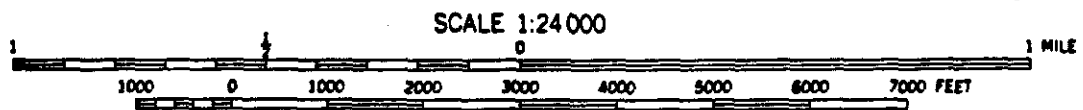
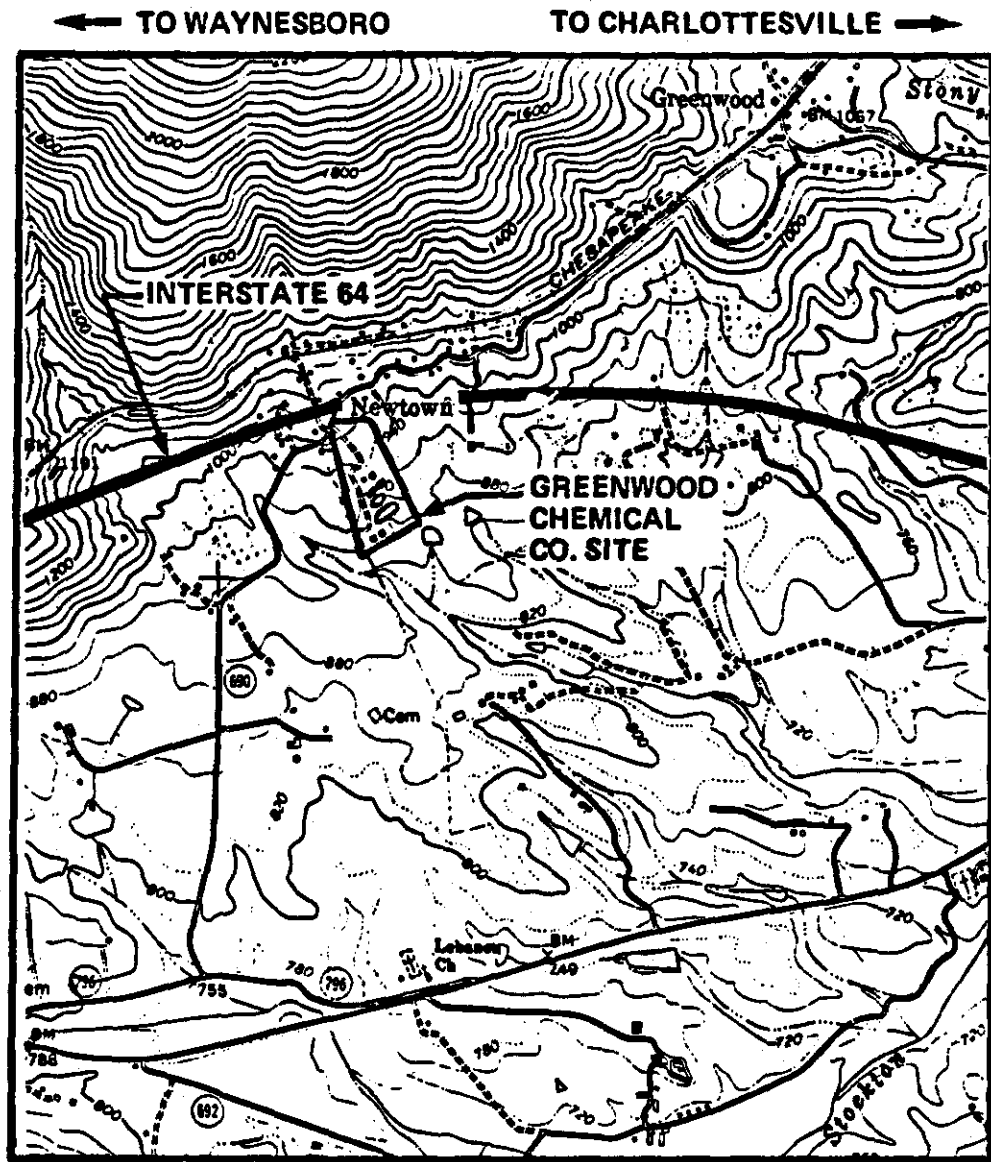
In order to improve estimates of waste volumes requiring excavation, samples will be collected in each area of the site where significant contamination is expected (all "hot" areas). In addition, samples will be collected at multiple depths to vertically delineate contamination levels.

In order to begin the evaluation of incineration as an alternative for treating excavated waste materials from the site, a series of tests will be performed on sludge and soil samples from each suspected hot area. These tests are not detailed treatability studies but are simple analyses intended to identify possible "fatal flaws" for the incineration alternative. Appendix A contains a description of the incineration evaluation tests to be performed.

Although the objective of the Interim Sampling Program is not to satisfy the Greenwood Chemical RI/FS data needs, the data collected will certainly enhance preparation of the project plans, especially helping to focus the RI/FS field activities.

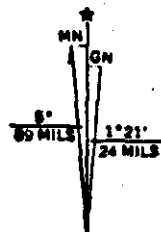
1.2 SITE DESCRIPTION AND HISTORY

The Greenwood Chemical Company is located on a site of presently approximately 18 acres near the town of Newtown in Albemarle County, Virginia. The site is about 12 miles west of the city of Charlottesville, at the base of the eastern slope of the Blue Ridge Mountains. A location map is presented in Figure 1-1. The facility has been operating for approximately 40 years manufacturing primarily industrial specialty chemicals. Main



WAYNESBORO EAST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

1964
PHOTOREVISED 1968



UTM GRID AND 1968 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET



QUADRANGLE LOCATION

U.S. ENVIRONMENTAL PROTECTION AGENCY
GREENWOOD CHEMICAL COMPANY RI/FS
SITE LOCATION MAP
FIGURE I-1 EBASCO SERVICES INCORPORATED

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operations at the site have been shut down since a toluene fire, which killed four workers, occurred on April 18, 1985.

The general layout of the site is shown in Figure 1-2. The main on-site structures include three manufacturing buildings containing idle process equipment (A, B and C), and an office building (not shown). South of the buildings are a cascade of five waste treatment lagoons which range in size from approximately 500 square feet to approximately 11,000 square feet. Two small farm ponds are located south and east of the Greenwood Chemical property. In addition, west and south of the property are small streams which receive surface runoff from the site. These streams flow into Stockton Creek. Stockton Creek flows into the Mechum River which is contiguous with the Rivana River. The Rivana River supplies the potable water for the city of Charlottesville and is a trout stream.

The Greenwood Chemical Site is underlain by fractured and weathered granite gneiss bedrock. The bedrock is mantled by a thick layer of saprolite which, in turn, is overlain by a discontinuous cap of soil cover. Groundwater is found in the saprolite and within bedrock fractures at depth. A bedrock fault strikes in an east-west direction across the northern boundary of the site at the base of a mountainous slope. Site topography trends in a southeasterly direction toward the stream along the southern border of the property. The slope at the plant site has a magnitude of approximately 10 %.

In recent years a major product produced at the site was naphthaleneacetic acid which is used to prevent fruit from falling from trees prior to harvest. A complete list of products manufactured over the years is not available but Product Information Bulletins and former workers claim that products included: catalysts used in the production of polyurethane, military gases, pesticides and pharmaceutical intermediates. One former worker claimed that a former owner of the facility purchased, processed and/or on-site disposed of large numbers of barrels of solid and semi-solid off-spec and waste chemicals of many types. One source reports that substances that were handled and possibly dumped on-site include sodium, phosphorus, toluene, caustic lye, military gases, hospital wastes and cyanide. Results of a recent initial magnetic survey of several areas on-site indicate the presence of approximately 400 buried drums.

During a recent site visit (July 1987) by Ebasco personnel it was noted that the upper three lagoons (numbered 1, 2 and 3 in Figure 1-2) appeared to be devoid of life. The lower two lagoons (numbered 4 and 5 in Figure 1-2) had an algae scum on the surface and may be supporting a population of frogs or toads. No readings above background were measured using an HNU meter. Metal drums were noted in some of the lagoons and some plastic drums were noted near the on-site buildings.

A hand-drawn map titled "SITE STUDY AREAS" showing a layout of various features. The map is oriented with North at the top, indicated by a north arrow. Key features include:

- Directions:**
 - TO EAST POND (indicated by an arrow pointing left)
 - TO SOUTH POND (indicated by an arrow pointing right)
 - TO STREAM (indicated by an arrow pointing down)
- Barren Soil:** A large irregular shape on the left side.
- Backfill Areas:**
 - BACKFILL NE (a rectangular area in the center-left)
 - BACKFILL N (a rectangular area in the center-right)
 - BACKFILL S (a rectangular area on the right side)
- Drums:**
 - DRUM 1, DRUM 2, DRUM 3 (small rectangular areas in the center)
 - EAST DRUM (a rectangular area in the center-left)
 - BUNKED DRUMS (a large rectangular area on the right side)
 - SURFACE DRUMS (a rectangular area on the right side)
- Long Objects (LOs):**
 - LO 1, LO 2, LO 3, LO 4, LO 5 (irregular shapes scattered across the map)
- Other Features:**
 - WASTE DUMP (a rectangular area in the center-right)
 - 'CLEAN' (a label near the center-right)
 - UPGRADED (a label near the bottom-left)

The documented history of the site is sketchy. Since the start of chemical processing operations the facility apparently had at least three different owners. Although there are currently five lagoons on-site, historical aerial photographs indicate at least two additional lagoons north of the current lagoons which apparently have been backfilled. In addition, a small impoundment south-west of lagoon 5 existed at one time. In 1978 the ponds may have been drained and bentonite liners may have been added to lagoons 1 and 2. It is not known if bentonite liners were installed in lagoons 3, 4 and 5. A local fish kill in 1971 and cattle kill in the mid-1970's were allegedly traced to an overflow of the lagoons on the Greenwood Chemical property. In addition to the incident which largely closed the facility in 1985, numerous industrial fires and accidents have been reported and investigated by OSHA.

The extent of contamination, and potential for migration to receptors prompted the EPA to propose a Removal Action for the site. Procedures may include: drainage of lagoons; sludge excavation and possibly incineration; removal and staging of buried drums; and excavation and possibly incineration of any contaminated soils.

1.3 SUMMARY OF EXISTING DATA

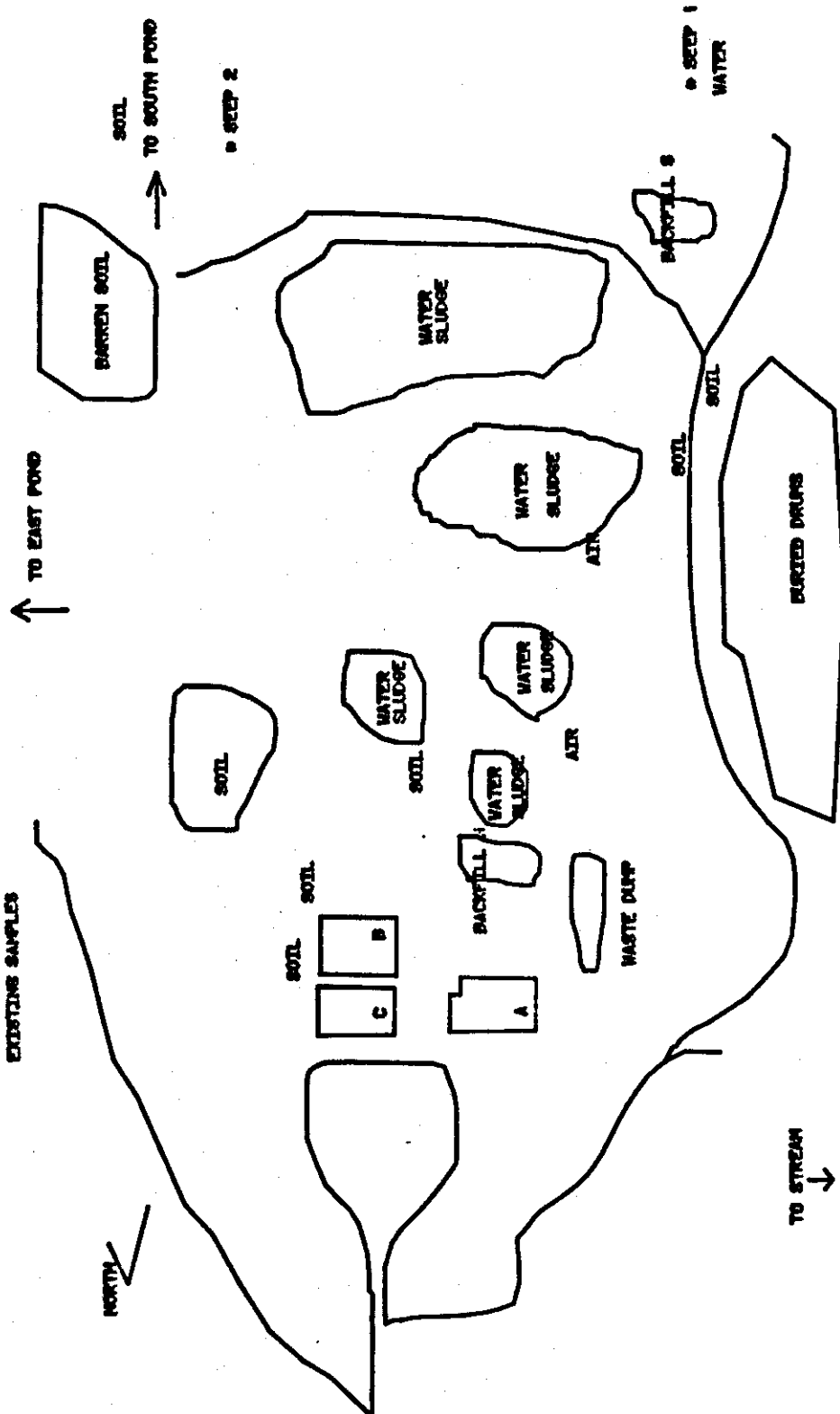
Samples of lagoon sludges and water, surface soils, groundwater, subsoils at monitoring well locations, and air have been taken intermittently since 1985 by different investigative teams at this site. More recent sampling has taken place off-site (e.g., groundwater, farm pond water and sediments, residential well water) to determine the degree of contaminant transport off the site. Sampling has been performed chiefly to determine if a time critical situation regarding contaminant transport from the site was present. Estimated sampling locations for existing data are shown in Figure 1-3.

LAGOON SLUDGES

Grab samples of sludge from lagoons 1, 2 and 4 were collected in May 1985. Duplicate grab samples from lagoon 1 had widely ranging concentrations of methylene chloride (620 to 800 ppm), toluene (27,000 to 390,000 ppm) chlorobenzene (0 to 910 ppm), benzene (0 to 800 ppm) and tetrachloroethene (0.006 to 2,100 ppm) in the volatile fraction. Lagoon 2 and 4 also contained methylene chloride and toluene with lagoon 2 exhibiting significantly higher concentrations than lagoon 4. Phenol and pentachloro phenol were found only in one of the samples from lagoon 1. Nitrobenzene (0 to 94 ppm), naphthalene (2,600 to 12,000 ppm), anthracene (9 to 87 ppm) were found in lagoon 1. Samples from lagoons 2 and 4 contained no detectable semi-volatile compounds.

1-3. GREENWOOD SITE

EXISTING SAMPLES



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Aldrin (0 to 66 ppm), p,p'-DDE (0 to 11 ppm) and heptachlor epoxide (0 to 45 ppm) were found in the lagoon 1 samples. Arsenic (0 to 50 ppm), cyanide (5.5 to 57 ppm) and phenolics (8 to 100 ppm) were also found in the lagoon 1 samples. Cyanides and arsenic were also found in samples from lagoons 2 and 4.

Grab samples of sludge from each of lagoons 3 and 5 were collected in June, 1985. The analyses indicated the presence of volatile organics in lagoon 3 but not in lagoon 5. Toluene was detected at a concentration of 15 ppm in lagoon 3 sludges. No phenol or its derivatives were found in this sampling series. Naphthalene and naphthaleneacetic acid were found in lagoon 3, but not 5. Both lagoon sludge samples contained arsenic and cyanide at levels of 6.1 and 13 ppm respectively in lagoon 3, and 13 and 14 ppm respectively in lagoon 5.

LAGOON LIQUIDS

Liquids in lagoons 1, 2 and 4 were sampled in May 1985. The sample from lagoon 1 had the highest levels of volatiles, containing benzene (1.3 ppm), tetrachloroethene (2.6 ppm) and toluene (80 ppm). Samples from lagoons 2 and 4 contained only toluene (6.0 and 0.006 ppm, respectively). No phenol or its derivatives were detected in any of the lagoon liquid samples. Isophore and naphthalene were detected at various levels in the liquid lagoon samples.

SURFACE SOILS

Surface soils were sampled in April, 1987 at five locations of suspected contamination on the site. These areas included: the drop box near lagoon 1, the barren area, the buried drum area, along the PVC piping feeding the lagoons and the area adjacent to the building which burned during the toluene fire. A background sample was also collected near a church. Approximate locations are shown on Figure 1-3.

The soil sample from the drop box area contained phenol, benzoic acid, naphthalene, 4-chloroniline and 2-methylnaphthalene in amounts ranging from 32 to 310 ppm (wet weight basis). Similar compounds were seen in samples from the area of the PVC piping and drum area, but concentrations were lower, ranging from 17 to 180 ppm, and 0.4 to 12 ppm, respectively. All other sampling locations did not show detectable contamination.

The soil samples also contained 60 to 72 tentatively identified compounds consisting of various benzene and naphthalene derivatives and many unknowns. The estimated concentrations of these compounds were in the same general range as observed for the standard HSL compounds.

A single soil sample was collected in 1985 near the confirmed drum burial area. Toluene (200 ppm) and chlorobenzene (2 ppm) were identified in the volatile fraction. Naphthalene (7.8 ppm), 1, 2, 4-trichloro benzene (4.8 ppm) and N-nitrosodi-methylamine (1.8 ppm) were identified in the semi-volatile fractions. Arsenic (3.8 ppm) and cyanide (1 ppm) were also detected in this sample.

SUBSURFACE SOILS

Head space analysis using a photovac gas chromatograph of soil cuttings performed during installation of the new monitoring wells (MW) in March 1987, revealed little detectable contamination by volatile organics. Toluene was tentatively identified in most soil samples, but the levels were at or just above the detection limits. The limitations in the analysis preclude any determination of the extent of contamination with soil depths. Phthalates were identified in a subset of these soil cuttings. The ubiquitous presence of these plasticizers as cross-contaminants in field sampling and laboratory equipment indicates that the levels detected (less than 1 ppm), are probably background. N-nitrosodiphenylamine was detected in one soil sample (MW 9, 7' to 10' depth).

GROUNDWATER

An existing monitoring well (MW) was sampled in June 1985 and contained low level concentrations of 1,2-dichloro-methane (19 ppb), and chlorobenzene (13 ppb). Tetrahydrofuran (400 ppb) and 2-propanol (10 ppb) were present as tentatively identified compounds. No HSL semi-volatile compounds were detected in this sample.

Additional MW's were installed in March 1987 at numerous locations both on and off the Greenwood Chemical property. See Figure 1-3 for approximate locations of a number of these MW's. All of the data from these MW's is currently preliminary and a formal report on the data has not yet been issued. Chlorinated ethanes and ethenes, toluene, benzene and substituted benzenes were detected in headspace analysis of MW water in March, 1987. MW 4 and 10 were the most contaminated and benzene and toluene were the most concentrated volatiles in the MW 4 headspace analysis.

Overburden wells were screened at depths ranging from 0 to 75 feet. The preliminary analytical results of samples from MW 1 indicated the highest levels of contamination of all groundwater samples collected, containing concentrations above 1 ppm of acetone, toluene and 4-methyl 2-pentanone. Methylene chloride, chloroform, trichloroethene, benzene, tetrahydrofuran, and 4-methyl 2-pentanol were found at sub-ppm concentrations. MW 1 is located near the confirmed buried drum area, west of the lagoons. MW 14 was the only bedrock well to show significant levels of possible contamination.

Toluene was also found in high concentrations (greater than 2 ppm) in samples from MW's 4 and 5 which are the closest wells to MW 1.

Some of the contaminants found in the sample from MW 1 were also found in the other MW samples but at sub-ppm concentrations.

Sub-ppm concentrations of chloroform, trichloroethene, toluene, tetrahydrofuran, chlorobenzene and 1,2-dichloroethane were preliminarily found in the bedrock wells which were open boreholes ranging in depth from 19 to 200 feet. MW 14, consisting of a pair of boreholes from 75 to 107 and 102 to 210 feet, was the most contaminated of those sampled with tetrahydrofuran contributing the most to this contamination. The MW 14 cluster is located near the southern farm pond (see Figure 1-3).

Three residential wells were sampled in 1985 and 1987, and all results were below detection limits or concentrations present were also identified in the blanks. One or two "unknown amides" were present in the tentatively identified compounds in the semi-volatile fractions in all of these water samples.

An unspecified seep area was sampled in 1985 and contained no detectable volatile or semi-volatile compounds except for two unknown amides. Similar results were seen in stream samples taken up and downstream of the site.

AIR

Air sampling consisted of the placing of carbon traps over lagoons 1 and 4 in June, 1985. Trace amounts of toluene were detected above lagoon 1. However, this value was only slightly above the detection limit.

1.4 RISK ASSESSMENT MODELS FOR DEVELOPMENT OF REMEDIAL ACTION LEVELS

A number of risk assessment pathways will be modeled for the chemicals present at the Greenwood Chemical Company site and will be used to calculate maximum acceptable soil concentrations based on the appropriate state or federal Applicable or Relevant and Appropriate Requirements (e.g., water quality standards). The pathways can be broadly characterized as direct exposures (e.g., soil inhalation and contact, groundwater ingestion) and indirect exposures (e.g., ingestion of milk from cows exposed to contaminated water).

The methodology will be conducted in accordance with the procedure outlined in the EPA Superfund Public Health Evaluation Manual (EPA, 1986) and the Draft Superfund Exposure Assessment Manual (EPA, 1986).

The first step in performing the quantitative risk analysis is the selection of indicator chemicals. Indicator chemicals will be selected based on prevalence, concentrations observed, distribution among environmental matrices, toxicity, and environmental behavior as representative of the entire spectrum of compounds found on-site. Another factor which will be considered in the selection of indicator chemicals is the ease of quantification by field analytical laboratories.

The second step is the identification and characterization of potential exposure pathways and receptors. Given the nature of the site, a major emphasis will be placed on human exposure through consumption of contaminated groundwater. Other possible routes of exposure that will be considered include inhalation and contact of contaminated soils, and ingestion of milk from cows exposed to contaminated pond water.

1.4.1 GROUNDWATER PATHWAY

Groundwater contaminant transport modeling will be used to help estimate groundwater flow rates and contaminant concentrations in order to establish clean-up levels for the lagoon sludge and soil removal operations. The intent of the modeling will be to evaluate groundwater contaminant concentrations at potential off-site receptors as a means of determining the source area clean-up levels.

A primary purpose of the soil removal operations will be to ensure that groundwater contaminant concentrations exiting the site are below acceptable doses. Therefore, the soil clean-up levels must represent concentrations at which any continued migration of contaminants into the groundwater system will meet the acceptable dose levels at the receptor

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locations. Based on these criteria the objective of the modeling will be to simulate groundwater contaminant concentrations at any time or distance from contaminated soil source areas. Upon simulating a groundwater concentration which meets the acceptable dose level at a particular receptor location, the corresponding soil source concentration or clean-up level can be established.

The model to be utilized in this study is the Rapid Assessment Model presented by Donigian, Lo and Shanahan (1983). This model was developed for EPA's Office of Emergency and Remedial Response-Exposure Assessment Group as part of the Agency's continuing effort to develop or refine techniques used in exposure assessments.

The Rapid Assessment Model considers one-dimensional steady state transport of contaminants in both the unsaturated and saturated zones. The transport equations have been solved analytically so that a graphical technique (i.e., nomograph) can be used to provide estimates of how contaminant concentrations might change with time and distance from a source area. The model is not intended to provide a definitive, in-depth analysis of the complex fate and transport processes of contaminants in the subsurface environment.

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The Rapid Assessment Model was selected for three reasons:

1. This method allows for easy and quick estimates of contaminant concentrations for various times and distances.
2. For the purposes of this study an "order-of-magnitude" prediction can be obtained cost-effectively, with limited data resources.
3. The response time frame for the implementation of these results precludes the use of detailed computer models and other analytical techniques.

To incorporate use of the Rapid Assessment Model, a conceptualization of the subsurface system must be developed. This includes the unsaturated and saturated zones of contaminant migration. The unsaturated zone consists of the shallow soil cover and saprolite zone above the groundwater surface. The saturated zone consists of saprolite overlying and including a fractured bedrock matrix.

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To evaluate contaminant migration, two modeling scenarios will be simulated. The first scenario will consider one unsaturated zone and two saturated zones. Under this scenario the first or upper saturated zone will be the

saprolite below the groundwater surface and above the bedrock surface. The second or lower saturated zone will be the waterbearing bedrock fractures below the saprolite. Accordingly, the unsaturated and upper saturated zone will be modeled incorporating dispersion, degradation and retardation of the contaminants during transport through the subsurface unconsolidated materials. Since the lower saturated media will be approximated as a fractured bedrock matrix, contaminant transport with minimal dispersion and retardation will be considered for this zone. A continuous concentration input to all zones will be assumed.

Under the second scenario one unsaturated zone and one saturated zone will be evaluated for contaminant migration. The unsaturated zone will be modeled incorporating dispersion, degradation and retardation. However, the saturated zone will consider flow and transport entirely within microfractures in the saprolite and underlying bedrock with little or no dispersion and retardation. A continuous concentration input to both zones will be used.

The first step in utilizing the Rapid Assessment Model is to determine or estimate input parameters which characterize the subsurface materials at the site and the contaminants. The required parameters include the initial concentration of the contaminant, the degradation/decay rate of the contaminant, the dispersion rates, the retardation factor (which is a function of the partition coefficient, the bulk density of the media, and the volumetric water content or effective porosity in the saturated zone), and the groundwater flow velocity. The methodologies incorporated in the procedure accept only homogeneous descriptions of the transport media being modeled, however, parameter values may be altered to account for any heterogeneities that are known to exist. Various arithmetic procedures are then performed on these parameters yielding four dimensionless input values. Based on these input values the Rapid Assessment Model uses a nomograph procedure to assess the potential groundwater contamination and contaminant movement as a function of time and distance (i.e., vertical depth in the unsaturated zone or horizontal distance in the saturated zone).

The Rapid Assessment Model also allows for the linkage of unsaturated and saturated zones. This procedure involves two steps:

1. Approximating the time varying concentrations leaving the unsaturated zone, and estimating the source concentration for the saturated zone.

2. This step considers the contaminant concentration leaving the unsaturated zone, recharge from the waste site area, and groundwater flow.

The same initial concentration will be used for both upper and lower saturated zones.

The data required for the input parameters will be obtained from the proposed interim field sampling activities and from literature value estimates for similar subsurface materials and contaminants. The site specific field data to be collected (if not collected by others) will include source area soil contaminant characteristics, groundwater elevations and flow directions, soil total organic carbon content for use in establishing partition coefficients, soil bulk density, surface water body elevations, and stream flow measurements.

Literature values of rainfall quantity, evapotranspiration runoff, dispersivity and degradation/decay rate will also be used. Hydraulic conductivity and effective porosity/specific yield estimates will be determined from pump test data previously collected at the site.

Sensitivity tests will be conducted on some of the parameters collected from the site and on those estimated from literature values. For the parameters which are found to be sensitive, conservative values will be used so that the clean-up levels will ensure acceptable offsite groundwater pathway concentrations.

1.4.2 DIRECT CONTACT OF SURFACE SOILS

The site is currently unsecured. Since several homes, a church and a playground are located nearby, the possibility exists that both children and adults may come into contact with contaminated soils. This pathway may be especially relevant in non-vegetated regions of the site. Established parametric values from the EPA manuals and Reference Doses (RFDs) will be used to calculate acceptable soil contaminant concentrations.

1.4.3 INHALATION OF ON-SITE SOILS

This pathway is most critical in areas where soil particulates can become entrained in the wind, i.e., where little vegetative cover is present. Typically this exposure route is critical only in areas of extensive surface contamination. This pathway is also important when a soil disturbance occurs such as might take place during a removal action.

Established parametric values from the EPA manuals and Reference Doses (RFDs) will be used to evaluate this pathway. Prevailing meteorological conditions will be incorporated into the receptor model to back calculate acceptable soil concentrations.

1.4.4 INHALATION OF VOLATILIZED GASES FROM SLUDGES

This pathway is important for workers performing the draining of the lagoon waters at the site. Once the water is removed, the exposed sludges will release their volatile contaminants and this represents a potentially significant exposure pathway.

1.4.5 SURFACE WATER PATHWAY

The surface water associated with the site includes lagoon water, the adjacent stream and farm ponds. Direct human consumption of lagoon water is unlikely so this pathway is of lesser importance. Both the stream and farm ponds represent potential avenues for off-site transport of contaminants. The stream feeds into a trout stream which eventually enters the water supply for the City of Charlottesville, Virginia.

The farm ponds also represent an indirect pathway since dairy cows may ingest the contaminated water, concentrate these contaminants in their lipid-rich milk, and pass them on to human consumers. Although this may at first appear to be a minor pathway, the fact that a lactating cow may ingest up to 170 kg of water per day to produce 36 kg of milk per day (NAS, 1978; Nutrient Requirement of Dairy Cattle), indicates that this pathway may be important. Water and sediment samples to be collected during the Interim Field Investigation will be used to evaluate the surface water pathways.

1.5 OVERVIEW OF FIELD ACTIVITIES

The field activities to be conducted at the Greenwood Chemical site during the Interim Field Investigation to accomplish the required data acquisition are as follows:

PHASE I:

1. Site reconnaissance and clearing,
2. Geophysical surveys,
3. Lagoon sludge sampling,
4. Surface and subsurface soil sampling,

5. Sediment and surfacewater sampling,
6. Surfacewater and well measurements, and
7. Surveying of sampling locations.

PHASE II:

1. Lagoon underlying soil sampling, and
2. Sampling of soil under the buried drums.

Each of these activities are discussed in detail in Sections 3 and 4 of this FSAP.

It should be noted that sampling of soils beneath the lagoon liners in lagoons 1, 2 and 3 and sampling of soils beneath the buried drums will be performed during Phase II of the Interim Field Investigation. It is proposed that the collection of these samples takes place during the actual removal action planned for the site, following the draining and sludge excavation in the lagoons and excavation and staging of buried drums. Due to the significant expense and high level of health and safety risk associated with obtaining these samples during Phase I of the Interim Field Investigation it is cost-effective to postpone their collection.

2.0 GENERAL SITE OPERATIONS

2.1 DELINEATION OF STUDY AREAS

The Interim Field Investigation encompasses the present Greenwood Chemical site proper, as well as two farm ponds located to the south and southeast respectively, and a stream to the west of the property. The site map is presented in Figure 1-2.

This FSAP includes samples to be collected in the following study areas:

- o Five lagoons,
- o Three backfilled areas,
- o Waste dump area,
- o Two farm ponds,
- o Buried drum area,
- o Surface drum area,
- o Drum handling areas adjacent to process buildings,
- o Barren soil area,
- o Western stream,
- o Two farm ponds,
- o Two seep areas, and
- o Two background areas.

Details regarding locations and types of samples in each area are presented in Sections 3 and 4.

2.2 PROJECT ORGANIZATION AND PERSONNEL REQUIREMENTS

The project organization for the Interim Site Investigation will include technical specialists in:

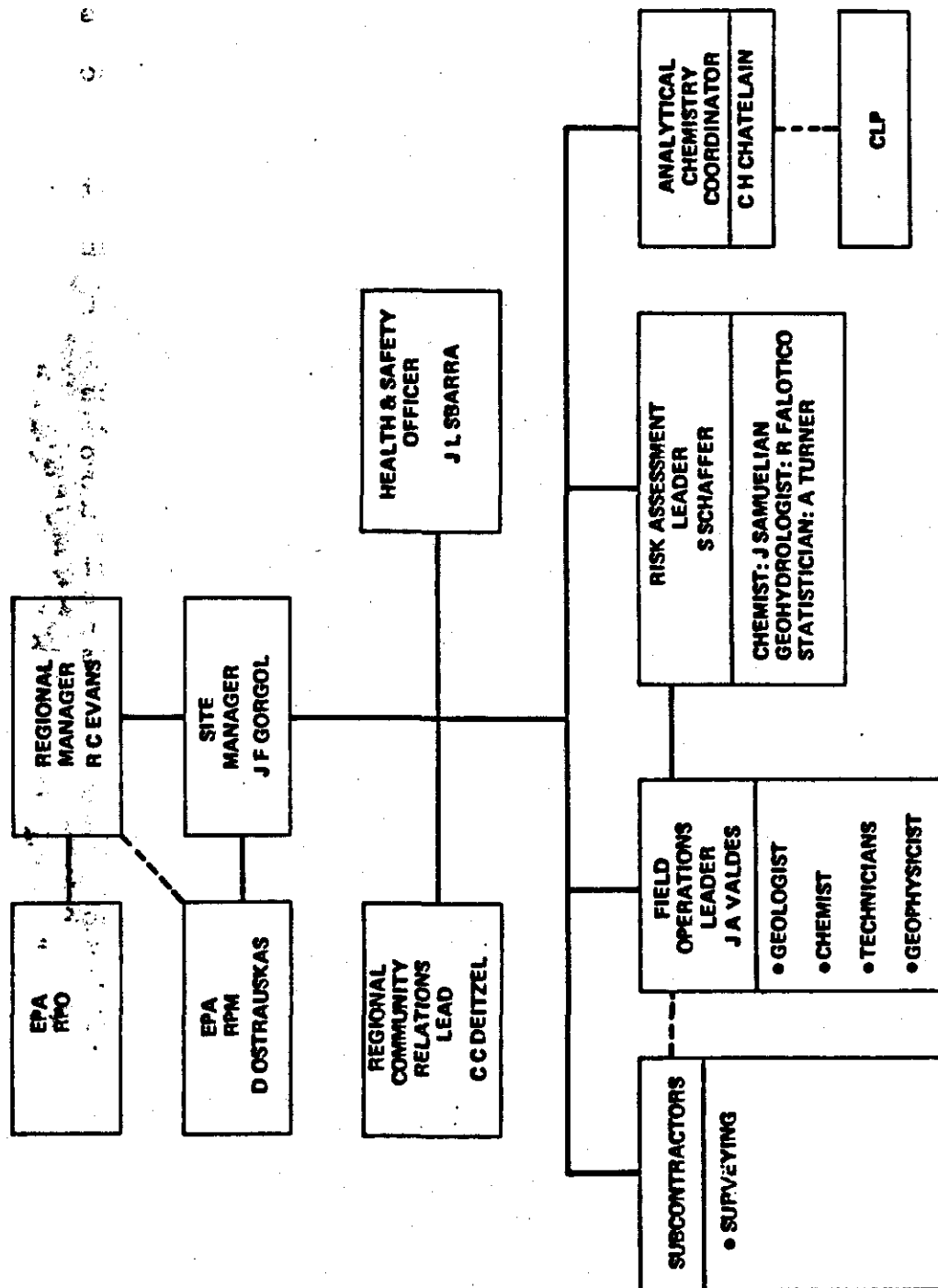
- o Geophysical Surveying,
- o Geotechnical Engineering,
- o Hydrogeology,
- o Environmental Chemistry,
- o Risk Assessments,
- o Statistics,
- o Health and Safety,
- o Field Sampling, and
- o Quality Assurance.

The field team will consist of:

- o Field Operations Leader - with expertise in sampling, quality assurance and geotechnical engineering, supervising operations for the entire sampling trip and providing expert consultation and decision-making on factors related to sampling.
- o Health and Safety Officer - responsible for ensuring adherence to health procedures described in the HASP and assisting in field operations.
- o Field Geologist(s) - present during the entire sampling trip; responsible for collecting, labeling, preserving, shipping and documenting samples; will also log soil and sediment samples.
- o Field Geophysicist - present for 1-2 week period prior to sampling activities; responsible for performing the geophysical surveys. Objectives of these surveys include locating areas of possible buried drums, characterizing subsurface stratigraphy, including depth to bedrock and determining lagoon depths.
- o Field Technician(s) - responsible for assisting in obtaining samples from various media, for sample preservation and preparation for shipment, and health and safety activities.

The project organization for the Interim Field Investigation is shown on Figure 2-1.

FIGURE 2-1
GREENWOOD CHEMICAL COMPANY SITE
INTERIM FIELD INVESTIGATION
PROJECT ORGANIZATION



2.3 REM III FIELD TECHNICAL GUIDELINES

Ebasco's Field Technical Guidelines for the REM III Program are intended to provide general technical guidance for project activities. These guidelines do not take precedence over the requirements of the project plans and procedures, and they cannot encompass the full range of conditions found in the field. The field guidelines applicable to this site are as follows:

- o FT-2.05 - Site Access Considerations
- o FT-3.03 - Sampling Station Location and Elevation Surveys
- o FT-4.02 - Resistivity and Electromagnetic Induction Surveys
- o FT-4.03 - Magnetic and Metal Detection Surveys
- o FT-4.04 - Seismic Refraction Surveys
- o FT-4.05 - Ground-Penetrating Radar Surveys
- o FT-6.03 - Decontamination of Drilling Rig and Sampling Equipment
- o FT-6.07 - Piezometric Head Measurements and Groundwater Contour Mapping
- o FT-7.02 - Groundwater Sample Acquisition
- o FT-7.03 - Soil and Rock Sample Acquisition
- o FT-7.04 - Management of Labeling and Preparation of Required Forms
- o FT-7.05 - Sample Identification and Chain-of-Custody
- o FT-7.06 - Sample Preservation
- o FT-7.07 - Sample Packaging and Shipment
- o FT-7.08 - Surface Water and Sediment Sampling
- o FT-7.10 - On-Site Water Quality Testing
- o FT-7.12 - Dioxin Sampling
- o FT-11.03 - Lagoon Sampling

- o FT-13.01 - Preparation, Approval and Submittal of Periodic Field Reports
- o FT-13.02 - Forms for Use in Remedial Investigation Activities
- o FT-13.03 - Field Notebook

2.4 DATA QUALITY OBJECTIVES (DQO) DETERMINATION

DQO's are based on the concept that different data uses require different levels of data quality. Data quality can be defined as the degree of uncertainty in the data with respect to precision, accuracy, reproducibility, comparability and completeness. The four levels of data quality are:

1. Screening (Level 1): This provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests).
2. Field analyses (Level 2): This provides rapid results and better quality than Level 1. Analyses include mobile-laboratory generated data.
3. Engineering (Level 3): This provides an intermediate level of data quality and is used for site characterization.
4. Confirmational (Level 4): This provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost recovery documentation. These analyses require full CLP analytical and data validation procedures.

Three DQO's will be employed in the Greenwood Chemical Interim Field Investigation. These include:

- o Confirmational (Level 4) analyses for TCL organic and inorganic compounds, dioxin, 2, 4-D, 2, 4, 5-T and Total Organic Carbon (TOC). This is required for performance of the risk assessment. Complete documentation is required since this site contains many compounds that are not TCL compounds but will be present as "Tentatively Identified Compounds" (TIC's). CLP-SAS with quick turnaround will be requested for selected samples. One or more samples from many of the study areas will undergo an expanded identification of TIC's.

- o Field screening (Level 1) for health and safety monitoring by work crews.
- o The physical-chemical-thermodynamic tests which will be performed in support of the evaluation of the incineration alternative will be performed at Level 3.

2.5 QUALITY ASSURANCE AND QUALITY CONTROL

This section described the QA/QC requirements for the Interim Field Investigation activities.

2.5.1 FIELD INSTRUMENT CALIBRATION AND PREVENTIVE MAINTENANCE

EPA-approved REM III Program Guidelines HS-3.01 (HNU P1-101 Organic Vapor Meter), HS-3.02 (OVA 128 Organic Vapor Analyzer), and FT-7.10 (On-site Water Quality Testing), describe calibration and maintenance procedures of HNU P1-101, OVA 128, pH, temperature and conductivity meters.

A master calibration/maintenance file is maintained for each measuring device, which includes at least the following information:

- o Name of device and/or instrument calibrated,
- o Device/instrument serial and/or I.D. number,
- o Frequency of calibration,
- o Date of calibration,
- o Results of calibration,
- o Name of person performing the calibration,
- o Identification of calibration gas (only HNU and OVA), and
- o Buffer solutions (pH meter only).

2.5.2 QA/QC SAMPLE COLLECTION AND FREQUENCY

2.5.2.1 TRIP BLANKS

A trip blank is an aliquot of deionized organic-free water that is sealed in a sample bottle prior to initiation of field work. Glass vials (40ml) will be used for VOA blanks. The sealed bottles are subsequently placed within a cooler and accompany field personnel during the sampling activities. A trip blank will be sent to the laboratory with each shipment of samples.

2.5.2.2 FIELD BLANKS

A field blank is an aliquot of deionized, organic-free water that has been used to rinse the field sampling equipment after decontamination. The field blank is a composite sample of this post-decontamination rinsate for each type of sampling equipment utilized during a day's field sampling activities. Field blank sample bottles will be from the CLP sample bottle repository, and the deionized, organic-free rinsate water will be obtained from EPA Region II, Edison, N.J. Glass jars will be used for TCL organic, Dioxin (TCDD), 2,4-D and 2, 4, 5-T blanks. Glass or polyethylene jars containing 2 ml. concentrated nitric acid will be used for TCL metal blanks.

2.5.2.3 COLLOCATED SAMPLES

Collocated samples are multiple discrete samples taken at the same location in order to provide quantification of the variation surrounding an estimate of the concentration of a given parameter (e.g., mean plus or minus a standard deviation, or a coefficient of variation about the mean). Collocated soil samples will be collected at several locations as described in Sections 3 and 4.

2.5.2.4 DUPLICATE/SPLIT SAMPLES

Duplicate/split samples will be analyzed to check laboratory reproducibility of analytical data from two aliquots of a sample taken at one location. Approximately eight percent of the total samples will be duplicated to provide an estimate of the precision of the methods used.

2.6 SAMPLE IDENTIFICATION SYSTEM

Each sample will be designated by an alphanumeric code which will identify the Greenwood Chemical Site, area location, matrix sampled and sequential sample number. Matrix identifiers are: GC (Greenwood Chemical); SL (sludge); SD (sediment); SW (surface water); SO (soil); FB (field blank) and TB (trip blank). Sample numbers within each matrix type will increase sequentially, except for the field blanks and trip blanks. The numbering codes for these samples will consist of the date taken, and a letter identifying the type of field equipment used for the blank (field blanks only).

Examples of how area locations will be identified include the following:

LG1 Lagoon 1
BDA Buried drum area
BL1 Backfilled lagoon area 1

DH1 Drum handling area 1
FP1 Farm pond 1
STR Stream

Examples of how field equipment used for field blank samples will be identified include the following:

SS Split spoon
CS Core sampler
HA Hand auger
HS Hand scoop
WS Water sampler

For example, a field blank obtained using a split spoon on 9/1/87 would be identified as GC-FB-090187-SS, the first sludge sample taken from lagoon 1 would be identified as CG-LG1-SL-01-SS, and a trip blank shipped on 9/1/87 would be identified as GC-TB-090187.

A master log will be prepared which references the samples taken to each sampling station.

2.7 SAMPLE CONTAINER AND HOLDING TIME REQUIREMENTS

Sample container and holding time requirements are specified in Table 2-1.

2.8 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and shipped according to REM III guideline FT-7.07. When sample shipments are sent, the U. S. Environmental Protection Agency Sample Management Office (SMO) will be telephoned either that day or the following morning and notified of the shipment, shipping company, airbill number, and number and type of samples being shipped.

2.9 SAMPLE DOCUMENTATION

Each field team is required to keep a field notebook. This field notebook will be a bound weatherproof logbook that is to be filled out at the time of sample collection. It will contain sample particulars including sample number, sample collection time, sample location, sample descriptions, sampling method used, weather conditions, field measurements, name (s) of sampler (s), and any other site operation observations.

A site logbook will be maintained by the Field Operations Leader or designated leader. This book will contain a summary of the days activities and will reference the sample teams' notebooks. Individual field notebooks (e.g., geologist's notebooks) will also be referenced. In addition, the site logbook will include any details concerning deviations from protocols, visitors' names, community contacts, lab addresses, equipment calibration,

TABLE 2-1
GREENWOOD CHEMICAL COMPANY SITE
SUMMARY OF CHEMICAL ANALYSES

SAMPLE TYPE	LABORATORY ANALYSIS	SAMPLE CONTAINER	PRESERVATION	HOLDING TIME	ANALYTICAL METHOD
Lagoon Sludges, Pond/Stream Sediments, and Soils	Volatiles	(1) 120 ml glass	Cool to 4 C	10 days analyze	CLP SOW (10/86)
	Extractables	(1) 8 oz glass	Cool to 4 C	10 days extract 40 days analyze	CLP SOW (10/86)
	TCL Inorganics	(1) 8 oz glass	Cool to 4 C	6 months except Hg (26 days)	CLP SOW (10/86)
	Dioxin Screen	(1) 8 oz glass	Cool to 4 C	6 months	CLP IFB SOW WA84-A002 (Qual. Scan only)
	2, 4-D and 2, 4, 5-T	(1) 8 oz glass	Cool to 4 C	7 days extract 40 days analyze	Pages 3-271 to 3-277 in EPA/CE-81-1
Surface Water	Total Organic Carbon	(1) 8 oz glass	Cool to 4 C	28 days	Pages 3-73 to 3-76 in EPA/CE-81-1
	Incineration Tests	(1) 600 ml glass	Cool to 4 C		See Appendix A
	Volatiles	(2) 40 ml glass	Cool to 4 C	7 days analyze	CLP SOW (10/86)
	TCL Inorganics	(1) 1-L Polyethylene or equivalent sized glass	HNO3 to pH 2; Cool to 4 C	6 months except Hg (26 days)	CLP SOW (10/86)
	Cyanide	(1) 1-L Polyethylene or equivalent sized glass	NaOH to pH >12	14 days	CLP SOW (10/86)

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etc. REM III guide FT-13.03 outlines the requirements of the site logbook.

A sample logbook will be maintained in the field office. This book will contain a separate sheet for each sample. Pertinent information, such as sampler's name, sampling location, date and time sampled, in situ measurements, or other specific information will be documented on these forms from information recorded in the field notebooks. An example log sheet is included in Appendix B. Items not required to complete will be indicated with N/A.

Chain-of-Custody forms, traffic reports, sample labels, custody seals, and other sample documents will be filled out as specified in FT-7.05. Examples of these forms are included in Appendix B.

2.10 QA/QC FIELD AUDIT

During the sample program, QA/QC of the sampling procedures will be performed as described in the REM III Quality Assurance Project Plan. The QA/QC officer will probably audit the field sampling program for one or two days to verify that the Field Sampling and Analysis Plan is being implemented.

2.11 FIELD CHANGES AND CORRECTIVE ACTION

The Site Manager or his designee is responsible for all Ebasco site activities. In this role the Site Manager at times is required to adjust the site programs to accomodate site specific needs. When it becomes necessary to modify a program, the Field Operations Leader will notify the Site Manager of the anticipated change and implement the necessary changes. The Regional Manager, the EPA Remedial Project Manager and the Regional Project Officer will be notified. If changes made are later determined to be unacceptable, the action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken.

The changes in the program are documented on a Field Change Request (FCR) which is signed by the initiator and Site Manager. A typical Field Change Request Form utilized to document field changes is shown in Appendix B. The FCRs shall be numbered serially starting with number "1".

The Site Manager is responsible for the control, tracking and implementation of the identified changes. Completed field change requests are distributed to affected parties which will include at a minimum: Regional Manager, Site Manager, Field Operations Leader and Quality Assurance Manager.

2.12 EQUIPMENT DECONTAMINATION PROCEDURES

All equipment involved in field sampling activities will be decontaminated prior to and subsequent to sampling. Equipment leaving the site will also be decontaminated as called for in the HASP. A steam generator and decontamination pad, with a mechanism for collecting decontamination water to be pumped into 55-gallon drums or appropriate holding facilities, will probably be installed near the field operations support facility. All drilling equipment will be steam-cleaned prior to use in accordance with FT-6.03.

The procedures for decontaminating the drilling rig, drill rods, bits, augers and other equipment is to steam clean, and brush to remove solids. The procedure to decontaminate other sampling equipment is as follows:

- o Use steam and brush to remove heavy solids from corers, dredges, split-spoons, and other durable equipment. Use potable water rinse for non-soiled equipment and glassware.
- o Alconox or liquinox detergent wash scrub.
- o Potable water rinse.
- o 10% nitric acid rinse.
- o Distilled deionized water rinse.
- o Acetone rinse (pesticide grade).
- o Air dry.
- o Distilled deionized water rinse.
- o Air dry.
- o Wrap or cover exposed ends in aluminum foil or butcher paper when not in use.

The pH, conductivity and temperature measurements for water samples will be performed in the field. To avoid cross contamination, the probes will be cleaned using deionized distilled water.

Extraneous contamination and cross contamination will be controlled using the decontamination procedure and by changing the samplers' gloves between samples.

If regular carbon steel split-spoon samplers are used instead of stainless steel or Teflon-lined split-spoon samplers, replace the 10% nitric acid rinse with 1% nitric acid rinse.

Personnel directly involved in equipment decontamination will wear protective clothing, as specified in the HASP.

2.13 CONTROL OF CONTAMINATED MATERIALS

All contaminated material generated during the Interim Field Investigation including decontamination solution, disposable equipment and clothing, soil cuttings, etc., will be collected, packaged, stored and/or disposed of according to approved procedures and/or as specified in REM III guide HS-1.06.

2.14 MOBILIZATION ACTIVITIES

Following approval of the FOP, arrangements will be made to schedule and identify field personnel, acquire sampling and health and safety equipment, and assist EPA with gaining site and off-site access.

Because of the limited sampling effort and duration of field activities, a field trailer will not be mobilized to the site. Arrangements will be made to rent a room in a local hotel for storage of sampling, health and safety, and other equipment. All removable equipment will be returned to the field operations vehicles or hotel room at the end of each working day. Any equipment left on-site will be secured to the extent possible to prevent unauthorized removal or vandalism.

No REM III personnel will enter the site until:

1. Written or verbal authorization is received from the Site Manager or designee.
2. At least 24-hour notice is given to the RPM before initiation of field activities.
3. Each field team member possesses personal identification in the form of a driver's license, company identification card, or a suitable substitute approved by the Field Operations Leader (FOL).

3.0 INTERIM FIELD SAMPLING AND ANALYSIS - PHASE I

Sections 3.1 through 3.8 define the objectives, sample numbers, locations and analyses, and field methods and materials associated with the activities planned for the first phase of the Interim Field Investigation. The field sampling and analyses to be performed in Phase I are also summarized in Table 3-1.

3.1 SITE RECONNAISSANCE

TABLE 3-1
SUMMARY OF FIELD SAMPLING AND ANALYSES PHASE I - GREENWOOD CHEMICAL SITE

AMPLE TYPE LOCATION	DEPTH	COMPOSITE	TCL* ORG.	TCL + INORG.	INCIN. TESTS	DIOXIN** SCREEN	TOC	BULK DENS.	VQA
SLUDGES									
Lagoons 4-5	S&D	NO	3+[1]	4					
Lagoons 4-5	S&D	NO	4	4					
	S: COL	NO	[2]	2					
Lagoons 4-5	S/D	V&H			1				
Lagoon 5	S&D	NO	2	2					
SOIL: SURFACE/SUBSURFACE									
Backfill North	S&[M]&D	H	1+[1]+[1]	3	3				
	M&D	H					2	2	
	M	H				1			
Backfill Northeast	S&[M]&D	H	2+[2]+2	6	3				
	M: COL	H	1	1		1			
	M&D	H					5	5	
Backfill South	S&D	H	2	2	2				
	D	H					1	1	
Surface Drums	S	H	1	1	1				
Drum Handling Areas	S	H	[3]	3					
	S	H(1-3)			1				
East Drums	S&[D]	H	1+[1]	2					
	D	H					1	1	
	S&D	V&H			1				
Waste Dump	S&[D]	H	1+[1]	2					
	D	H					1	1	
	S/D	V&H			1				
Barren Soil	S&D	H	2	2					
	D	H					1	1	
	S&D	V&H			1				
Upgradient	S&D	H	2	2	2		2	2	
Clean Area	S&D	H	2	2			2	2	
SEDIMENTS									
West Stream	S	H	3	3					
South Pond	S	H	1	1					
	S&D	H	4	4					
	D	H					2	2	
East Pond	S&D	H	4	4					
	D	H					2	2	
SURFACE WATER									
West Stream	S->D	V		3					3
Seeps 1-2	S->D	V		2					2
RESIDENTIAL WELL WATER									
Various			5	5					
BLANKS									
Trip									14
Field			8	9		1	3		1
TOTAL-PHASE I			63	69	16	3	22	19	20

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TABLE 3-1
SUMMARY OF FIELD SAMPLING AND ANALYSES PHASE I (continued)

* Samples in brackets are for expanded identification of tentatively identified compounds (TICs) e.g., identify the following number of next highest peaks excluding internal standards and surrogate compounds:

<u>Fraction</u>	<u>Minimum Number of TICs to be Identified</u>
Volatiles	25
Base Neutrals	25
Acid Extractables	10

** Includes analyses for 2, 4-D and 2,4,5-T

+ Includes Cyanide analyses

Key

S = Surface
D = Deep
M = Middle Depth
H = Horizontal
V = Vertical
COL = Collocate

Objectives

- o Locate and mark proposed soil, sediment and surface water sampling locations,
- o Define sludge consistency and depth within lagoons 4 and 5 to finalize access and collection methods for sediment sampling, and
- o Define and clear seismic survey and magnetometer transects, as necessary.

3.2 GEOPHYSICAL SURVEY

Objectives

Geophysical investigations will be performed on-site to achieve the following specific objectives:

- o Identification of additional barrels (steel or fiberglass) to assist the precise placement of interim sampling locations,
- o Determination of depth and condition of bedrock including delineation of the fault to guide groundwater modeling, and
- o Estimation of lagoon sediment depths in lagoons 4 and 5 to estimate potential waste volumes.

Techniques to be used in this survey will include: magnetometry, ground penetrating radar, seismic refraction, fathometry, and electromagnetic conductivity profiling.

Technical Approach

Geophysical data will be referenced to a site grid to be established in the field by the field crew. Where possible, this field grid will in turn be referenced to grids used during the previous limited magnetometer survey performed by TAT personnel.

Because of the varying objectives and the likelihood of both steel and fiberglass barrels being present on-site, a variety of geophysical methods will be employed. These will be discussed below in terms of each of the objectives listed above.

Identification of Additional Barrels

For delineation of trenches and additional barrels, a combination of magnetometry, electromagnetic conductivity

(EM), and ground penetrating radar (GPR) will be used. Clayey soils at this site may preclude use of EM and/or GPR measurements. In order to assess this possibility, a one-day test program is suggested, to be performed at burial trenches identified during the TAT magnetometry survey (westernmost magnetic survey area on Figure 3-1).

The test program will consist of EM and GPR profiles across the known trenches and the adjacent undisturbed ground. The objective of the test program is to ascertain whether either of these methods will be capable of identifying drums or disturbed ground. If soil conductivities are favorable, GPR may be able to identify trenches as well as metal and fiberglass drums. EM profiles may be able to distinguish disturbed and undisturbed soils, because the backfilled areas may have different electrical conductivities due to either contaminants or moisture content.

If, after completing the test program, EM and/or GPR show potential for locating trenches or barrels then field work can begin at other parts of the site. EM and GPR profiling will be performed in the two "barren" areas (the barren soil area and the northeast backfilled area) where the TAT magnetometer survey did not locate any steel drums. It is possible that these areas may contain either fiberglass drums or backfilled lagoons which may be identified by the EM or GPR.

Although the TAT magnetic survey supposedly showed an absence of barrels in the two "barren" areas, these two areas will be included in the magnetic survey since the exact locations of magnetometer coverage, that is the actual survey grids, were not shown in the TAT report.

Magnetometer measurements will be performed at twenty-five foot line intervals to delineate areas of steel drum burial in general areas shown on the accompanying plan map (Figure 3-1). In general, magnetometer measurements will be limited to areas most likely to contain buried drums; areas with well-established trees will be avoided.

A combined EM-31 and GPR survey will be conducted in lagoons 1, 2 and 3 to determine if any drums are present. The geophysical survey equipment will be mounted in a small rubber boat or on a raft and pulled from one side to the other side across the lagoon. In the event that field personnel cannot accompany the geophysical equipment as it traverses the lagoons, it is still feasible to collect geophysical data by turning the equipment on and letting it operate and display data on the respective analog recorders as the equipment is towed from one side of the lagoon to the other.

A Geonics EM-31 conductivity meter, with a depth of penetration of approximately 15 to 20 feet, will be used in conjunction with a continuous chart recorder. The magnetometer survey will be performed using a Geometrics G-816 proton precession magnetometer or equivalent. A GPR system manufactured by Geophysical Survey Systems, Inc. will be used during this project. Either a 500 MHz or 300 MHz antenna will be employed, depending on site conditions. Data will be recorded on continuous charts, and anomalies will be marked on a base map of the Greenwood Chemical Site.

In summary, this phase of the geophysical program will include a one-day test program of EM and GPR surveys, a magnetometer survey program along the survey lines shown on Figure 3-1, combined EM and GPR profiling across lagoons 1, 2 and 3, and if necessary and feasible, GPR and/or EM profiling to delineate specific barrel and/or trench locations.

Depth and Condition of Bedrock and Fault Evaluation

Seismic refraction surveys will be conducted along the lines of investigation shown on Figure 3-2 to determine the depth to bedrock, the condition of bedrock based on seismic velocity values, and an estimation of the physical properties of the overlying saprolite (weathered bedrock) material based on seismic velocity values. Appropriate data acquisition procedures will be utilized to maximize the potential for the detection of any significant faults and/or fracture zones in the bedrock should they exist. The seismic refraction data will be acquired using a Weston Geophysical Corporation developed and manufactured digital data acquisition system and 400 foot spread lengths with 10 and 20 foot geophone spacing. Where feasible, offset shot locations will be utilized to maximize the amount of seismic information obtained on the high velocity bedrock in order to assess bedrock fracturing fault conditions.

The seismic refraction profile lines will extend approximately 600 feet north of the plant structures in order to provide a sufficiently large areal coverage and data for determining the location of a possible fault in the vicinity of the plant structures. Magnetic profiles at 100 foot intervals will be extended a similar distance north of the plant's structures to assist in the fault location investigation. Significant faults usually involve rock types with differing magnetic properties and are therefore easily detectable by a magnetic survey.

Three thousand six hundred linear feet of seismic refraction profiling are programmed. 400 foot individual

24 channel line segments with offset shot points where feasible will be used. The seismic refraction lines have been located on natural ground based on the available site history as determined from air photos.

Depth of Sediments in Lagoon 4 and 5 and in Backfill NE

The depth of sediment will be determined in lagoons 4 and 5 only. A combination of fathometer and seismic refraction surveys will be used to determine sediment thickness. To minimize health and safety considerations, field personnel will remain on-shore and the appropriate instrumentation will be floated across the lagoons using a small boat to transport the fathometer or using floats to minimize contact of the seismic refraction cable with the bottom sediments.

It is anticipated that a few profiles will be acquired across each lagoon, probably at 50 foot intervals. The fathometer instrumentation will be turned on at one edge of the lagoon and the boat will be pulled by a rope to the other side of the lagoon where the instrumentation will be turned off. Since there will be no fathometer operator to coordinate the locationing of the fathometer traverse with the recording, positioning of the fathometer record will be approximate using time intervals. Fathometer data will be acquired using a Raytheon DE-719 survey fathometer.

The thickness of sediment in the lagoons can be estimated by using a seismic refraction technique in conjunction with the fathometer information. Water and water saturated sediments have a seismic velocity of 5,000 ft/sec. If the sediments in the lagoons are not water saturated, their velocity will be less than 5,000 ft/sec. If the seismic refraction investigation outside but in the vicinity of the lagoon area indicate that the top of the saprolite is shallow with a seismic velocity of greater than 5,000 ft/sec. then seismic refraction investigations are feasible for the determination of the thickness of sediment in the lagoons. The thickness of sediment in the lagoons will be equal to the thickness of the 5,000 ft. sec. or lower velocity material less the water depth as determined by the fathometer survey.

The seismic refraction data will be acquired using a marine geophysical cable with sealed pressure transducer to be floated across the lagoons. Since the lagoons are small, seismic energy will be generated outside the lagoons. Using the depth to saprolite information obtained around the lagoon, time delays will be determined and the thickness of the lagoon sediment will be computed as previously described.

The thickness of suspected sludge in Backfill NE will be determined by a combination of seismic refraction and electrical methods. Two short seismic lines with close geophone intervals will be positioned in north-south and east-west directions across Backfill NE. Time delays determined by comparing these seismic data with data along adjacent lines over natural material will be used to closely approximate the sludge thickness. Electrical resistivity point tests will also be conducted along each of the seismic lines. The electrical properties of the sludge should be significantly contrasting with natural materials so that the point test (vertical electrical soundings) should determine the sludge thickness.

3.3 LAGOON SLUDGE SAMPLING (LAGOONS 4 and 5)

Objectives

- o Identify and quantify chemical contaminants in the sludges of lagoons 4 and 5 to support the development of remedial action levels for on-site soils,
- o Improve estimates of volume of material requiring excavation,
- o Identify any characteristics of the sludge which could preclude treatment by incineration, and
- o Estimate the variability of contamination in lagoons 4 and 5 to provide input required to design an optimum sampling program to confirm attainment of remedial action levels.

Locations, Numbers and Analyses

Approximate sample locations and types are shown in Figure 3-3 and described below:

Lagoons 4 & 5:

Near inlet: surface and depth samples from a single core.

- Analyses:
- o TCL organics (4 analyses)
 - o TCL inorganics (4 analyses)

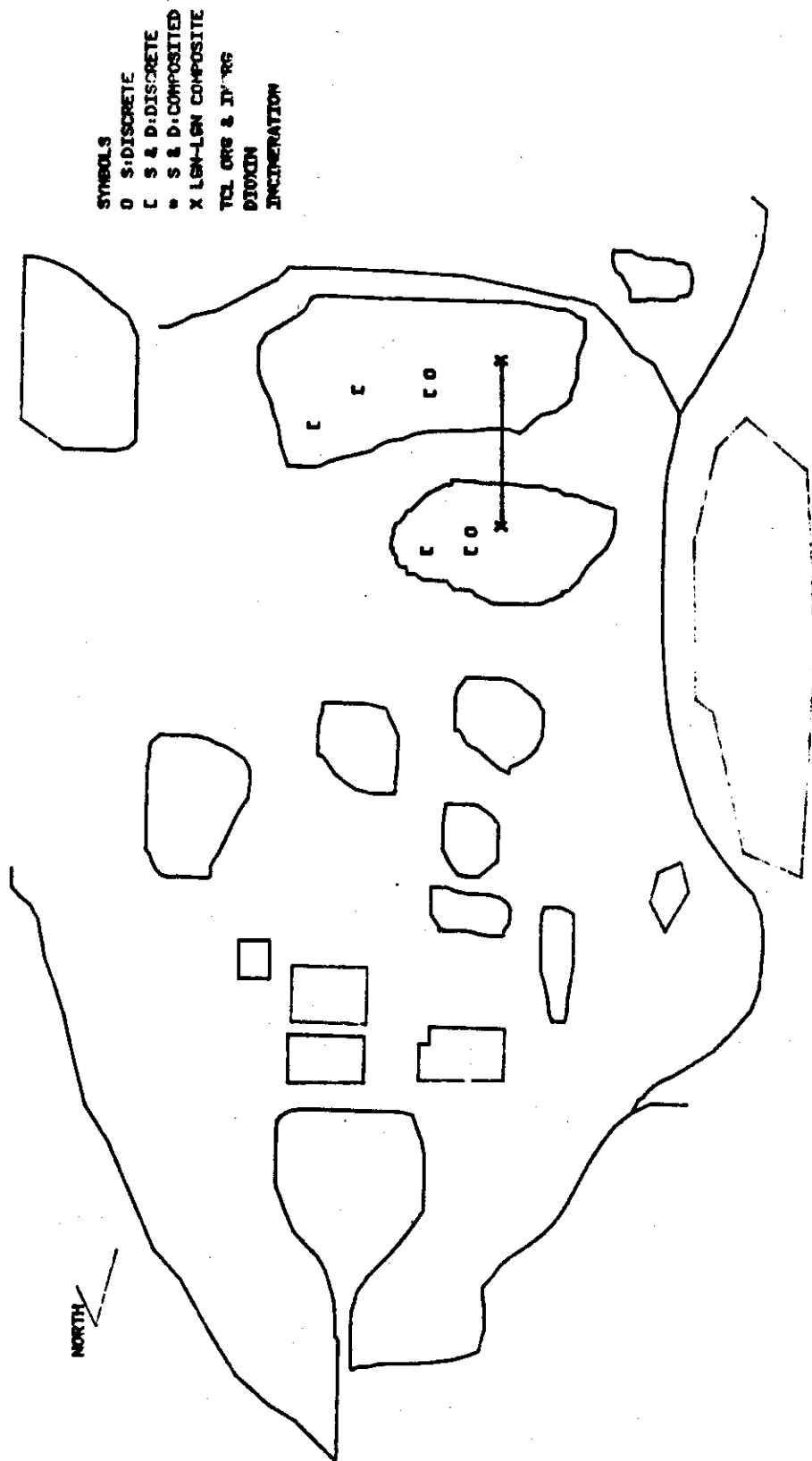
Lagoons 4 & 5:

Lagoon center: surface and depth samples from a single core; surface sample from collocated core.

- Analyses:
- o TCL organics (6 analyses)
 - o TCL inorganics (6 analyses)

3-3. GREENWOOD SAMPLES

LAGOON SLUDGES



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Lagoon 5:

Surface and depth samples from an additional core.

Analyses: o TCL organics (2 analyses)
TCL inorganics (2 analyses)

Lagoons 4 & 5:

Single sample from two vertically and horizontally composited cores (one from each lagoon center).

Analyses: o Incineration tests (1 analysis)

Rationale: Sludges will be mixed prior to incineration.

Methods and Materials

Samples will be collected using either a pair of boats lashed together (with an open space between for sample retrieval) or some other type of floating equipment.

Full-depth sludge samples will be collected either with a gravity-type corer or with a split spoon sampler. Vertically composited samples will be taken from the entire core, following mixing. Horizontally composited samples will be taken from well-mixed material from specified depths of the two cores.

Details of the lagoon sludge sampling procedures are presented in Section 5.1.

3.4 SURFACE AND SUBSURFACE SOIL SAMPLING

Objectives

- o Identify chemical contaminants to support the development of remedial action levels for on-site soils,
- o Identify any characteristics of soils which could preclude treatment by incineration,
- o Define the volume of soils requiring excavation during the removal action, and
- o Define post-removal sampling plan to verify sufficient soil removal.

Location, Numbers, and Analyses

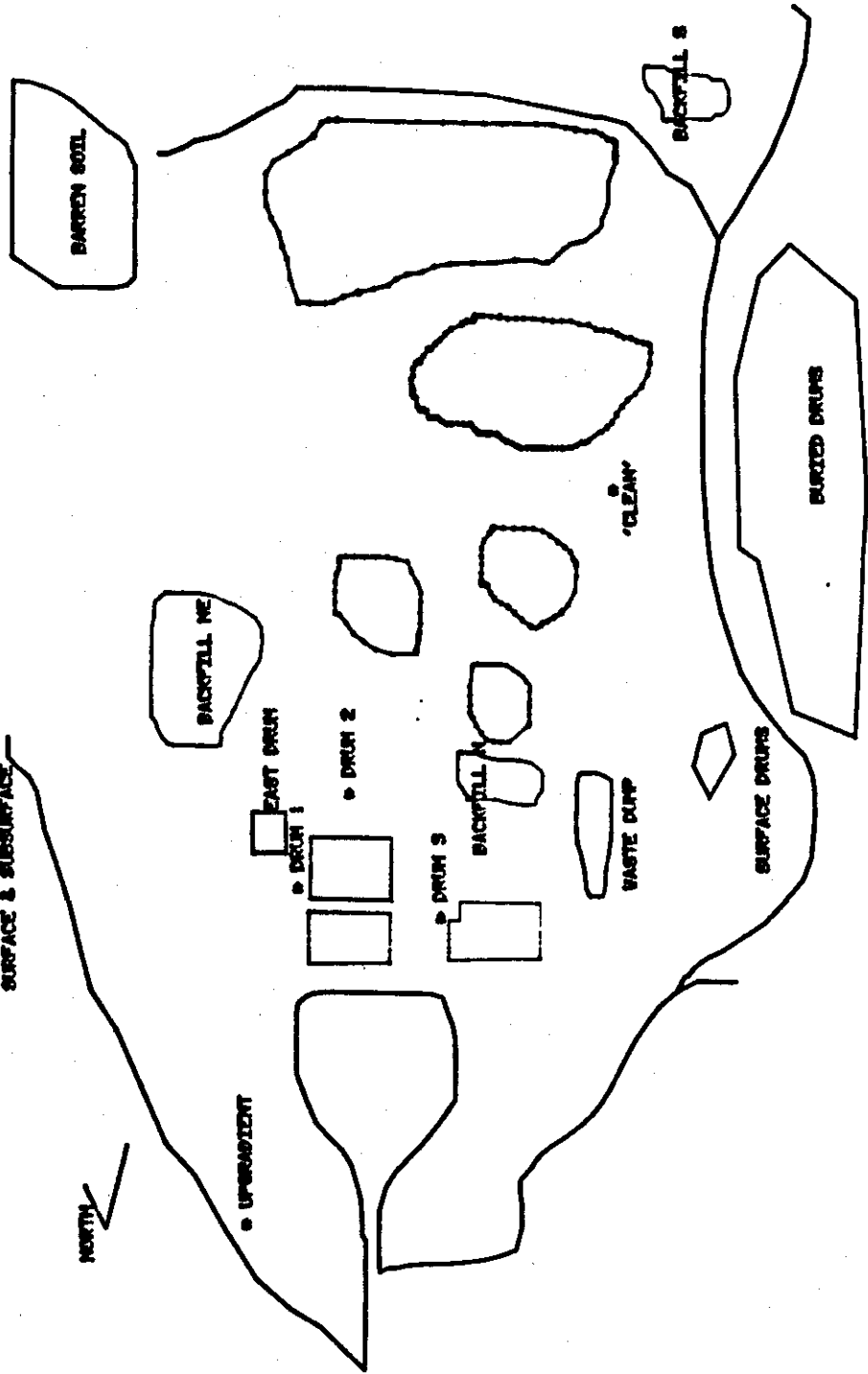
Approximate sample locations are shown in Figure 3-4 and described below:

North Backfilled Area:

Surface, middle and depth samples horizontally composited from two cores.

3-4. GREENWOOD SAMPLES

SOIL LOCATIONS,
SURFACE & SUBSURFACE



Analyses: o TCL organics (3 analyses)
o TCL inorganics (3 analyses)
o TOC and bulk density (2 analyses-from middle and deep locations)
o Dioxin Screen/2, 4-D; 2, 4, 5-T (1 analysis-from middle depth)
o Incineration tests (3 analyses)
Rationale: Surface, middle and deep strata will correspond to backfill, previous sludge, and beneath lagoon layers, respectively.

Northeast Backfilled Area:

Two sets of surface, middle and deep samples horizontally composited from two cores. Horizontally composited collocated sample from mid-depth.

Analyses: o TCL organics (7 analyses)
o TCL inorganics (7 analyses)
o TOC and bulk density (5 analyses from middle and deep locations)
o Dioxin screen/2, 4-D/2, 4, 5-T (1 analysis - from middle depth)
o Incineration tests (3 analyses - horizontal composite from each of the 3 depths)

Rationale: Surface, middle and depth strata will correspond to backfill, previous sludge, and beneath lagoons layers, respectively. The area of the northeast backfilled lagoons exceeds that of the north area, therefore, requiring estimates of sampling variance.

South Backfilled Area:

Surface and depth samples horizontally composited from two cores.

Analyses: o TCL organics (2 analyses)
o TCL inorganics (2 analyses)
o TOC and bulk density (1 analysis from deep location)
o Incineration tests (2 analyses)

Rationale: Surface and depth layers will correspond to backfill and previous sludge, respectively.

Surface Drum Area:

A single shallow sample, horizontally composited from 2 or more shallow cores.

Analyses: o TCL organics (1 analysis)
o TCL inorganics (1 analysis)
o Incineration tests (1 analysis)

Drum Handling Areas Adjacent to Plant:

Single horizontally composited surface samples (3), composited from 2 or more shallow cores at each location.

- Analyses: o TCL organics (3 analyses)
o TCL inorganics (3 analyses)
o Incineration tests (1 analysis - composite of three areas)

East Drum Handling Area:

Surface and depth, horizontally composited samples from two or more cores.

- Analyses: o TCL organics (2 analyses)
o TCL inorganics (2 analyses)
o TOC and bulk density (1 analysis - from deep location)
o Incineration tests (1 analysis - vertical and horizontal composite)

Rationale: Historical aerial photographs indicate the presence of a square structure in this area; believed to be either an excavated pit or storage area.

Waste Dump Area:

Surface and depth, horizontally composited samples from two or more cores.

- Analyses: o TCL organics (2 analyses)
o TCL inorganics (2 analyses)
o TOC and bulk density (1 analysis - from deep location)
o Incineration test (1 analysis - vertical and horizontal composite)

Rationale: Historical aerial photographs indicate presence of drums in this area. An unidentified vent was observed during an initial site visit.

Barren Soil Area:

Surface and depth, horizontally composited samples from two or more cores.

- Analysis: o TCL organics (2 analyses)
o TCL inorganics (2 analyses)
o TOC and bulk density (1 analysis - from deep locations)
o Incineration tests (1 analysis - vertical and horizontal composite)

Rationale: Completely non-vegetated area was observed during an initial site visit. There is no obvious explanation for the barrenness.

Upgradient:

Surface and depth, horizontally composited samples from two or more cores.

- Analysis: o TCL organics (2 analyses)

- o TCL inorganics (2 analyses)
- o TOC and bulk density (2 analyses)
- o Incineration tests (2 analyses)

Rationale: Determine background contaminant levels. Collection will be on the site property, south of the geologic fault and north of the process buildings.

Clean Area:

Surface and depth, horizontally composited samples from two or more cores.

- Analyses:
- o TCL organics (2 analyses)
 - o TCL inorganics (2 analyses)
 - o TOC and bulk density (2 analyses)

Rationale: Define a possible lower bound for the soil clean-up criteria.

Methods and Materials

Surface and subsurface soil samples will be collected using either a stainless steel scoop or trowel, hand auger or a split-spoon sampler. Details of the soil sampling procedures are presented in Section 5.3

3.5 SEDIMENT SAMPLING

Objectives

- o Characterize the surface water pathway for the site risk assessment to define remedial action levels for on-site soils.

Locations, Numbers, and Analyses

Sample location areas are shown in Figure 1-2 and described below:

Western Stream:

3 horizontally composited surface sediment samples from upstream, downstream and midstream locations.

Rationale: Upstream will define background contaminant levels and the downstream sample will define worst case estimates for the risk assessment. A midstream sample is optional, depending upon observation of an entry point for surface water from the site.

South Farm Pond:

1 horizontally composited surface sample from the pond feed ditch; surface and depth samples (2), horizontally composited from the pond inlet area and a stagnant area.

Rationale: Cows were observed drinking from farm ponds near the site.

East Farm Pond:

Surface and depth samples (2), horizontally composited from the pond inlet area and a stagnant area.

Sediment Sample Analyses:

- o TCL organics (12 analyses)
- o TCL inorganics (12 analyses)
- o TOC and bulk density (4 analyses - from deep locations)

Methods and Materials

The procedure for collection of farm pond sediment samples are the same as those described above for collection of lagoon sludges from lagoons 4 and 5. The procedures for collection of stream sediments are also the same except that access to the area can be obtained by using waders instead of a boat or raft.

3.6 SURFACE WATER SAMPLING

Objectives

- o Characterize the surface water pathway for the site risk assessment to define remedial action levels for on-site soils.

Locations, Numbers and Analyses

Sample location areas are shown in Figure 1-2 and described below:

Western Stream:

Single vertically composited aqueous sample from each of the 3 stream stations.

Seeps:

Single aqueous samples from each of the 2 seeps located south and southwest of lagoon 5.

Surface Water Analyses:

- o TCL organics VOA fraction only (5 analyses)
- o TCL inorganics (5 analyses)

Methods and Materials

Shallow surface water samples will be collected using a stainless steel bucket. Surface water samples at depth will be collected using a messenger type sampler or equivalent.

3.7 SURFACE WATER AND WELL MEASUREMENTS

Objectives

- o Develop a database for groundwater modelling which will be used to develop remedial action levels for on-site soils.

Locations, Numbers, and Analyses

- o Water level measurements will be taken in existing monitoring wells if this information is not being collected periodically by others.
- o Stream flow measurements will be taken if the needed data is not available from the USGS or other sources.
- o A number of residential wells on properties in the vicinity of the site may be sampled. The level of effort and other cost associated with this activity will be estimated and budgeted when the scope is defined.

3.8 SURVEYING OF SAMPLING LOCATIONS

Exact locations of sample collection will be staked with survey sticks and blind-staked into the ground. Stake locations will be recorded in the field log book, using distance measurements from fixed landmarks such as trees and buildings. Sampling locations will be surveyed by a licensed surveyor as soon as possible following completion of sample collection activities.

4.0 INTERIM FIELD SAMPLING AND ANALYSIS - PHASE II

This Section describes the objectives, sample numbers, locations and analyses, and field methods and materials associated with the activities planned for Phase II of the Interim Field Investigation. The field sampling and analyses to be performed in Phase II are also summarized in Table 4-1.

4.1 LAGOON UNDERLYING SOIL AND OTHER SOIL SAMPLING

Objectives

- o Determine the volume of excavation material beneath liners in lagoons 1-3,
- o Define post-removal sampling plan to verify sufficient removal of contaminated soils under lagoons 1-3,
- o Identify chemical contaminants to support the development of remedial action levels for on-site soils, and

TABLE 4-1
SUMMARY OF FIELD SAMPLING AND ANALYSES PHASE II - GREENWOOD CHEMICAL SITE

<u>SAMPLE TYPE</u> <u>LOCATION</u>	<u>DEPTH</u>	<u>COMPOSITE</u>	<u>TCL</u> <u>ORG.</u>	<u>TCL+</u> <u>INORG.</u>	<u>INCIN.</u> <u>TESTS</u>	<u>DIOXIN*</u> <u>SCREEN</u>	<u>TOC</u>	<u>BULK</u> <u>DENS.</u>	<u>VOA</u>
<u>SOILS UNDERLYING</u>									
<u>LAGOON LINERS</u>									
Lagoons 1-3	S&D	NO	12	12		1	12	12	
	S: COL	NO	3	3			3	3	
Lagoon 1&2	S/D	V&H			1				
<u>SOIL: SURFACE/SUBSURFACE</u>									
Buried Drums	S&D	H	4	4	2				
	S: COL	H	1	1					
	D	H					2	2	
	S&D	V	1			1			
<u>BLANKS</u>									
Trip									4
Field			4	4		1	2		
<u>TOTAL PHASE I</u>			25	24	3	3	19	17	4

* Includes analyses for 2, 4-D and 2,4,5-T

+ Includes Cyanide analysis.

Key

S = Surface
D = Deep
M = Middle Depth
H = Horizontal
V = Vertical
COL = Collocate

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- o Identify any characteristics of the soils which could preclude treatment by incineration.

Locations, Numbers, and Analyses

Approximate sample locations and types are shown in Figure 4-1 and described below:

Lagoons 1-3:

Lagoon center: surface and depth samples from each of two cores; single depth sample from collocated core.

- Analyses:
- o TCL organics (15 analyses)
 - o TCL inorganics (15 analyses)
 - o TOC and bulk density (15 analyses)
 - o Dioxin screen/2, 4-D/2, 4, 5-T (1 analysis-from lagoon 1 surface)

Lagoons 1 & 2:

Single sample from two vertically and horizontally composited cores (one from each lagoon).

Analysis: o Incineration tests (1 analysis).

Rationale: Excavated material will be mixed prior to incineration.

Buried Drum Area:

Two surface and two deep samples, each composited from two cores from two nearby locations; a single horizontally composited surface sample near the unloading area.

- Analyses:
- o TCL organics (5 analyses)
 - o TCL inorganics (5 analyses)
 - o TOC and bulk density (2 analyses - from deep locations)
 - o Dioxin screen/2, 4-D/2, 4, 5-T (1 analysis - from a horizontally and vertically composited sample from 2 cores)
 - o Incineration tests (2 analyses - one horizontally composited surface sample and one horizontally composited deep sample)

Methods and Materials

It is proposed that the collection of these samples take place during the actual removal action following the draining and sludge excavation in these lagoons. The methods and materials for collection of these samples are the same as those which will be used to collect the surface and subsurface soils during Phase I. See Section 3.4 for further details.

4-1. GREENWOOD SAMPLES

SUB-LINER SCOLS



SYMBOLS
 O S. DISCRETE
 C S40-DISCRETE
 * S40-COMPOSITE
 X LOW-LOW COMPOSITE
 TEL. GRS & IRONS
 TOC & DENSITY
 INCINERATION
 DIOXIN

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5.0 SAMPLING PROCEDURES - BY MEDIA

This section presents sampling procedures to be used during the Interim Field Investigation where modified from, or not included in existing REM III guidelines.

5.1 LAGOON SLUDGE SAMPLING PROCEDURES

Lagoon sludges will be sampled using either a gravity corer or a split spoon.

1) Gravity Coring Device

A gravity corer is a metal tube with a replaceable tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration.

1. Attach a precleaned corer to the required length of sample line.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through liquid bottom.
4. Retrieve corer with a smooth, continuous lifting motion. Do not bump corer as this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer.
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or equivalent.
7. Check that a Teflon liner is present in cap if required. Secure the cap tightly.
8. After following proper decontamination procedure, label and prepare sample(s) for delivery to the laboratory for analysis.

2) Split Spoon

1. Decontaminate split spoon;
2. Drive the tube utilizing a sledge hammer or other drive-hammer. Do not drive past the bottom of the head piece as this will result in compression of the sample;

3. Record the length of the tube that penetrated the material being sampled;
4. Withdraw the sampler and open by unscrewing bit and head and splitting barrel. If split samples are desired, divide the tube contents in half longitudinally;
5. Repeat steps 2 - 4 if insufficient sample volume is obtained;
6. Cap the sample containers, place in a double plastic bag, attach the label, record all pertinent data in the field log and complete the chain-of-custody form;
7. Preserve and/or place sample(s) on ice, if required; and
8. After following proper decontamination procedures, label and prepare sample(s) for delivery to the laboratory for analysis.

5.2 SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES

Surface and subsurface soil samples will be collected using either a stainless steel scoop or trowel, hand auger or a split-spoon sampler.

1) Scoop or Trowel

The following procedures apply to the collection of surface soil using a stainless steel scoop/trowel.

1. Select the sampling point and collect the sample at the appropriate depth;
2. Homogenize and transfer the sample into the appropriate sample container using a clean stainless steel table spoon or trowel;
3. If it is determined that the sample volume is insufficient to satisfy the analytical requirements for a particular sample, another soil sample adjacent to the first sample will be collected;
4. Repeat Steps 1 and 2, if necessary;
5. Fill out sample log, labels and chain-of-custody forms; and

6. Preserve and/or place sample(s) on ice, if required.

2) Hand Auger

Surface Samples

1. Decontaminate auger;
2. Remove rocks, twigs, and other non-soil materials from selected sampling point;
3. Begin turning the auger with a clockwise motion and continue until the desired sampling depth is obtained;
4. Remove the auger and transfer the samples into a clean stainless steel pan or bucket. Homogenize and transfer the samples into the appropriate container using a clean stainless steel table spoon or trowel;
5. If it is determined that the sample volume is insufficient to satisfy the analytical requirements, another shallow surface soil sample adjacent to the first sample will be collected;
6. Repeat Steps 3 to 4, if necessary;
7. Cap the sample container, place in plastic bag, attach label, record all pertinent data in the field log book and complete the chain-of-custody forms;
8. Preserve and/or place sample(s) on ice, if required; and
9. After following proper decontamination procedures, label and prepare sample(s) for delivery to the laboratory for analysis.

Samples at Depth

1. Remove soil from desired depth at each sampling location prior to sample collection to avoid cross-contamination between soil strata.
2. Using a decontaminated auger, place the auger at the specific sampling depth and begin turning the auger with a clockwise motion and continue until the desired sampling depth is obtained; and

3. Repeat steps 5 - 9 as for surface samples.
- 3) Split Spoon
 1. Decontaminate split spoon;
 2. Drive the tube utilizing a sledge hammer or other driving device. Do not drive past the bottom of the head piece as this will result in compression of the sample;
 3. Record the length of the tube that penetrated the material being sampled;
 4. Withdraw the sampler and open by unscrewing bit and head and splitting barrel. Transfer the sample into a clean stainless steel bucket or pan. Homogenize and transfer the sample into appropriate container using a stainless steel table spoon;
 5. Repeat steps 2 - 4 if insufficient sample volume is obtained;
 6. Cap the sample containers, place in a double plastic bag, attach the label, record all pertinent data in the field log and complete the chain-of-custody form;
 7. Preserve and/or place sample(s) on ice, if required; and
 8. After following proper decontamination procedures, label and prepare sample(s) for delivery to the laboratory for analysis.

When using a split spoon sampler to sample below the 2-ft. depth, the borehole will be advanced using a hand auger, portable power auger or rig-mounted power auger. Power augers will use hollow stem auger attachments for advancing the borehole or casings will be driven in order to maintain a clean inner auger casing, which serves to minimize cross-contamination of samples.

5.3 SEDIMENT SAMPLING PROCEDURES

Procedures for collection of sediment samples from the stream and farm ponds are the same as those for collecting lagoon sludge samples (see Section 5.1).

5.4 SURFACE WATER SAMPLING PROCEDURES

Surface water sampling procedures will be those described in REM III Field Technical guideline No. FT-7.08.

6.0 INTERIM FIELD INVESTIGATION MANAGEMENT

The estimated schedule and costs for the Interim Field Investigation are included in this Section.

6.1 SCHEDULE

The schedule of key activities associated with the Greenwood Chemical Interim Sampling program is as follows:

<u>Activities</u>	<u>Estimated Performance Period</u>
<u>PHASE I:</u>	
Mobilization and Site Recon.	8/31/87 - 9/09/87
Site Clearing	9/03/87 - 9/10/87
Geophysical Surveys	9/10/87 - 9/30/87
Sludge/Soils/Water Sampling	9/21/87 - 10/03/87
Chemical Analyses	9/21/87* - 10/31/87
Data Validation	10/05/87 - 11/14/87

PHASE II:

Phase II will take place during the removal action, following initial excavation of lagoon sludges and buried drums.

* Depends on availability of laboratory resources which will be determined following submittal of formal request forms.

The above schedule is based on the following additional assumptions:

- o EPA, with Ebasco's assistance as requested, can obtain permission from all necessary landowners to perform the sampling activities.
- o Subcontracting for drilling services are not required.
- o The required laboratory space is available when needed.
- o Ebasco will have access to the site study areas for a minimum of 12 hours a day during the period of field activities.

6.2 ESTIMATED COSTS

The estimated cost for the Interim Field Investigation is as follows:

Subtask

- 14C Pre-Sampling Activities
 - Laboratory scheduling
 - Site reconnaissance
 - Site clearing
 - Secure licensed surveyor
- 14D Geophysical Surveying
- 14E Interim Field Sampling-Phase I
 - Mobilization/demobilization
 - Collect and ship all samples
- 14F Post-Sampling Activities-Phase I
 - Data validation
 - Lab coordination
- 14G Interim Field Sampling-Phase II
 - Pre sampling activities
 - Mobilization/demobilization
 - Collect and ship all samples
- 14H Post Sampling Activities-Phase II
 - Data validation
 - Lab coordination

Total

The above cost include all workhours, travel and equipment costs for the tasks described in this FOP except as stated below. The above costs do not include costs for laboratory analyses because it is assumed that all analyses will be performed by Contract Laboratory Program (CLP) resources. If, for any reason, non-CLP laboratory services are sought, additional funding will be requested. Costs for data validation are included in the Post-Sampling Activities subtasks. It is assumed that data validation will be performed by Ebasco instead of by the usual Region III CLP data validation personnel (per recent discussion with Region III CLP coordinator). A detailed breakdown of the costs will be provided to the EPA under separate cover.

The above costs are based on the following additional assumptions:

- o Subcontracting for drilling services are not required.

- o The cost for geophysical surveying includes the performance of all activities described in this FSAP. Depending on the results of the test program certain activities may not be feasible and will not be performed. The actual cost will then be reduced accordingly.
- o The cost for interim field sampling includes the surface water and well measurement activities described in Section 3.7 except that costs for collection and shipment of water samples from residential wells have not been included. Some of the activities described in Section 3.7 may not be necessary if this information exists or will become available.
- o It is anticipated that an increased level of effort will be required to complete Task 14A - Develop Cleanup Criteria/Collect Information. This is because the amount of data reduction and groundwater modelling which will be performed is greater than anticipated in the original scope proposed in May. These additional costs will be estimated and submitted in a future WA Amendment.

APPENDIX A INCINERATION TESTS

The following tests will be performed in order to identify characteristics of the soils and sludges which could preclude treatment by incineration.

(1) Chlorine Concentration

This analysis will be conducted using ASTM Standard D2361-66 titled "Chlorine in Coal".

(2) Proximate Analysis

The proximate analysis is a determination of the percentage of volatile matter, fixed carbon, moisture contents and ash in a particular sample. The proximate analysis will be conducted using ASTM Standard D3172-73 titled "Proximate Analysis of Coal and Coke." If the material is expected to have a volatile-fixed carbon ratio greater than 2, the procedure shall be modified so that the flaming time shall be conducted for one minute at the furnace mouth rather than in the furnace interior.

(3) Higher Heating Value

The higher heating value (HHV) of a particular sample is defined as the amount of energy a material can release, including the sensible and latent heat of vaporization of liquid water formed under ideal combustion conditions in a pure oxygen environment. The HHV determination is conducted in an adiabatic calorimeter. Depending on the amount of spatter, the material may have to be pelletized with or without a binder. Also, it may be necessary to use benzoic acid to obtain complete oxidization. The HHV will be conducted using ASTM Standard D2015-77 titled "Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter."

(4) Ash Fusion Temperatures

The ash fusion temperature is a measure of the degree of deformation of a cone of ash as a function of temperature. Temperatures are recorded when the cone shows initial deformation, softening, hemispherical, and is fluid. The test will be conducted in an oxidizing atmosphere. The ash fusion temperature determination will be conducted using ASTM Standard D1857-68 titled "Fusibility of Coal and Coke Ash."

APPENDIX B

REM III PROGRAM FORMS

LIST OF FORMS

- CHAIN-OF-CUSTODY SEAL
- CHAIN-OF-CUSTODY RECORD FORM
- SPECIAL ANALYTICAL SERVICES PACKING LIST
- INORGANICS TRAFFIC REPORT
- ORGANICS TRAFFIC REPORT
- SAMPLE IDENTIFICATION TAG
- SAMPLE LABEL
- SAMPLE SHIPPING LOG
- PROJECT SAMPLE SUMMARY
- SAMPLE LOG SHEET
- WEEKLY FIELD SUMMARY REPORT
- FIELD CHANGE REQUEST FORM
- SUMMARY LOG OF BORING
- GROUNDWATER LEVEL MEASUREMENT SHEET

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CUSTODY SEAL   **CUSTODY SEAL**

Signature

Date

Date

Signature

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CHAIN OF CUSTODY RECORD

[illegible]

Production: Original Assignment Required. Copy to Correspondence Field File

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U.S. ENVIRONMENTAL PROTECTION AGENCY
 CLP Sample Management Office
 P.O. Box 818 - Alexandria, Virginia 22313
 Phone: 703/557-2490 - FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICE
 PACKING LIST

Sampling Offices	Sampling Date(s)	Ship To:	For Lab Use Only
Sampling Contacts	Date Shipped:		Date Samples Rec'd:
(name)	Site Name/Code:	Attn:	Received By:
(phone)			

Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

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U.S. ENVIRONMENTAL PROTECTION AGENCY - HUTS

INORGANICS TRAFFIC REPORTSample Number
MCE 401

① Case Number: _____ Sample Site Name/Code: _____ _____ _____	② SAMPLE CONCENTRATION (Check One) ____ Low Concentration ____ Medium Concentration ③ SAMPLE MATRIX (Check One) ____ Water ____ Soil/Sediment	④ Ship To: Attn: _____ Transfer _____ Ship To: _____
⑤ Sampling Office: _____ Sampling Permit: _____ (Name) _____ (Phone) _____ Sampling Date: _____ (Begin) _____ (End) _____	⑥ Shipping Information: Name Of Carrier: _____ Date Shipped: _____ Airway Number: _____	
⑦ Sample Description: (Check One) ____ Surface Water ____ Ground Water ____ Leachate ____ Mixed Media ____ Solids ____ Other _____ (specify) MATCHES ORGANIC SAMPLE NO _____	⑧ Mark Volume Level On Sample Bottle Check Analytes required ____ Total Metals ____ Cyanide	MCE 401 - Total Metals MCE 401 - Total Metals MCE 401 - Cyanide MCE 401 - Cyanide MCE 401 MCE 401 MCE 401

SHO COPY

300071



ORGANICS TRAFFIC REPORT

Sample Number
CH 302

① Case Number: Sample Site Name/Code: 	② SAMPLE CONCENTRATION (Check One) <input type="checkbox"/> Low Concentration <input type="checkbox"/> Medium Concentration ③ SAMPLE MATRIX (Check One) <input type="checkbox"/> Water <input type="checkbox"/> Soil/Sediment	④ Ship To: Attn: Transfer Ship To:
--	--	---

⑤ Regional Office: Sampling Personnel: (Name) (Phone) Sampling Date: (Begin) (End)	⑥ For each sample collected specify numl of containers used and mark volume leve on each bottle. <table border="1"><thead><tr><th></th><th>Number of Containers</th><th>Approximate Total Vol</th></tr></thead><tbody><tr><td>Water (Extractable)</td><td></td><td></td></tr><tr><td>Water (VOA)</td><td></td><td></td></tr><tr><td>Soil/Sediment (Extractable)</td><td></td><td></td></tr><tr><td>Soil/Sediment (VOA)</td><td></td><td></td></tr><tr><td>Other</td><td></td><td></td></tr></tbody></table>		Number of Containers	Approximate Total Vol	Water (Extractable)			Water (VOA)			Soil/Sediment (Extractable)			Soil/Sediment (VOA)			Other			CH302 • Water (Extractable) CH302 • Water (Extractable) CH302 • Water (Extractable) CH302 • Water (Extractable) CH302 • Water (VOA) CH302 • Water (VOA) CH302 • Soil/Sediment (Extractable) CH302 • Soil/Sediment (Extractable) CH302 • Soil/Sediment (VOA) CH302 • Soil/Sediment (VOA)
	Number of Containers	Approximate Total Vol																		
Water (Extractable)																				
Water (VOA)																				
Soil/Sediment (Extractable)																				
Soil/Sediment (VOA)																				
Other																				

⑦ Shipping Information Name of Carrier Date Shipped: Airbill Number:	⑧ Sample Description <input type="checkbox"/> Surface Water <input type="checkbox"/> Mixed Media <input type="checkbox"/> Ground Water <input type="checkbox"/> Solids <input type="checkbox"/> Leachate <input type="checkbox"/> Other (specify) _____	⑨ Sample CH302 • Soil/Sediment (VOA) CH302 • Soil/Sediment (VOA)
---	---	---

⑩ Special Handling Instructions: (e.g., safety precautions, hazardous waste)
--

BACOPY

★ GPO 835-853

Project Code	Station No.	Month/Day/Year	Time	Designate:		Preservative: Yes <input type="checkbox"/> No <input type="checkbox"/>
				Comp.	Grab	
Station Location				ANALYSES BOD Solids (TSS) (TDS) (SS) COD, TOC, Nutrients Phenolics Mercury Metals Cyanide Oil and Grease Organics GC/MS Priority Pollutants Volatile Organics Pesticides Mutagenicity Bacteriology		
Station Location Remarks:				Station Location Remarks:		

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY



300073

EBASCO PROJECT: _____
SAMPLE NO. _____
DATE: ____/____/____ TIME: _____ HRS
MEDIUM: _____
TYPE: GRAB ☐ COMPOSITE ☐
PRESERVATION: _____
ANALYSIS: _____
SAMPLED BY: _____
LAB NO.: _____
REMARKS: _____

300074

SOS Required: (Default required)

Site Leader:
EPA Project Officer:

ORGANICS OR INORGANICS

300075

PROJECT SAMPLE SUMMARY

DATE _____
SAMPLER INITIALS _____

[illegible][illegible]

300076

SAMPLE LOG SHEET

ATTACHMENT B-14
FT-13.02, REV. 0

I. SAMPLE IDENTIFICATION

PROJECT SITE NAME: _____ EPA PROJECT SITE NO. _____
 REM III CONTRACTOR: _____ SITE MANAGER: _____
 SAMPLE NAME/NUMBER: _____ DATE ____/____/____ TIME: _____ HRS
 SAMPLING LOCATION/DEPTH _____ TYPE: _____ GRAB _____ COMPOSITE
 SAMPLE MATRIX: _____ SURFACE WATER _____ GROUNDWATER _____ SEDIMENT _____ SOIL
 _____ WASTE _____ OTHER (SPECIFY) _____
 ☐ ENVIRONMENTAL SAMPLE ☐ HAZARDOUS SAMPLE
 SAMPLED BY: (PRINT) _____ (SIGNATURE) _____

II. SAMPLE SOURCE

_____ WELL _____ OUTFALL _____ LEACHATE _____ DRUM
 _____ BORING _____ RIVER/STREAM _____ BLDG/STRUCTURE _____ OTHER
 _____ TEST PIT/TRENCH _____ IMPOUNDMENT _____ TANK _____ (SPECIFY) _____

SOURCE DESCRIPTION _____

III. FIELD OBSERVATIONS/MEASUREMENTS

APPEARANCE/COLOR: _____
 VOLATILE ORGANIC ANALYSIS (VOA): _____ HNU _____ OVA _____ OTHER
 VOA READINGS: OFF SAMPLE _____ RESPIRATORY ZONE _____
 LEL/O₂/H₂S READINGS: _____
 RADIOACTIVITY (MR/hr): _____
 PH: _____ CONDUCTIVITY: _____ TEMPERATURE: _____
 SALINITY: _____ OTHER: _____
 OBSERVATIONS: _____

IV. SAMPLE DISPOSITION

PRESERVATION: _____
 LABORATORY NAME: _____
 LABORATORY LOCATION: _____ ON-SITE _____ OFF-SITE
 FORWARDED TO LABORATORY: DATE ____/____/____ TIME: _____ HRS
 LABORATORY SAMPLE NO. _____ TR/SAS/ _____
 CHAIN-OF-CUSTODY NO. _____ DSR NOS. _____

V. ADDITIONAL REMARKS

300077

WEEKLY FIELD SUMMARY REPORT

SUNDAY

Date : _____ Personnel _____
Weather: _____ Onsite _____

Site Activities: _____

MONDAY

Date : _____ Personnel _____
Weather: _____ Onsite _____

Site Activities: _____

TUESDAY

Date : _____ Personnel _____
Weather: _____ Onsite _____

Site Activities: _____

Figure 15-1

EBASCO SERVICES INCORPORATED
FIELD CHANGE REQUEST
-TYPICAL-

EPA Work Assignment No.	EBASCO	Work Charge Number	Field Charge No.
-------------------------	--------	-----------------------	------------------

FCR

To	Location	Date
----	----------	------

Description:

Reason For Change:

Recommended Disposition:

Field Operations Leader (Signature)

Date

Disposition:

Site Manager

Date

Distribution: Regional Manager

Others as required

Quality Assurance Manager

Site Manager

Field Operations Leader

300079

[illegible][illegible]

THIS FORM HAS BEEN DEVELOPED SPECIFICALLY TO CONSOLIDATE ALL DRILLING, SAMPLING, AND TESTING OPERATIONS ASSOCIATED WITH HAZARDOUS WASTE FIELD DRILLING OPERATIONS.

GROUNDWATER LEVEL MEASUREMENT SHEET

PROJECT NAME	_____	LOCATION	MUNICIPALITY	_____
PROJECT NO.	_____		COUNTY	_____
PERSONNEL	_____		STATE	_____
DATE	_____		STREET OR	_____
			MAP LOCATION	_____
			(IF OFF-SITE)	_____

WEATHER CONDITIONS			EQUIPMENT NO.	_____
TEMPERATURE RANGE	_____		EQUIPMENT NAME	_____
PRECIPITATION	_____		LATEST CALIBRATION DATE	_____
BAROMETRIC PRESSURE	_____			_____
TIDALLY-INFLUENCED	<input type="checkbox"/> YES		<input type="checkbox"/> NO	

WELL OR		ELEVATION OF	WATER LEVEL		GROUNDWATER
PIEZOMETER	DATE/	REFERENCE POINT	INDICATOR	ADJUSTED	ELEVATION
NO.	TIME	(FEET) *	READING	DEPTH	
_____	_____	_____	(FEET) *	(FEET) *	(FEET) *

* All elevations to nearest 0.01 feet.

300081

SECTION II

300082

HEALTH AND SAFETY PLAN
INTERIM FIELD INVESTIGATION
GREENWOOD CHEMICAL COMPANY SITE
ALBEMARLE COUNTY, VIRGINIA

AUGUST 1987

300083

UA# 136-31P5 GREENWOOD CHEMICAL
 AMENDMENT# 002 ONLY

DETAILED COST ESTIMATE BREAKDOWN

TASK / DESCRIPTION	TOTAL LABOR	*... OTHER DIRECT COSTS ...*	TOTAL COC'S	SUBCONTRACT POOL	LAB ANALYSIS	GRAND TOTAL
14C PRE-SAMPLING ACTIVITIES	13,870	1,652	275			15,896
14D GEOPHYSICAL SURVEYING	40,602	8,095	8,055			56,752
14E INTERIM FIELD SAMPLING-PHASE I	33,225	5,449	10,428			55,270
14F POST SAMPLING ACTIVITIES-PHASE I	12,851	75	220	5,040		13,761
14G INTERIM FIELD SAMPLING-PHASE II	13,618	3,025	3,766			20,877
14H POST SAMPLING ACTIVITIES-PHASE II	7,632	75	220			8,543
TASK TOTAL -->	121,797	18,371	22,524	440	852	2,073
TOTAL	121,797	18,371	22,524	440	852	2,073
				44,262		5,040
						171,099

TOTAL COSTS INCLUDE DIRECT SALARY, OVERHEAD, G&A, and ALL FEES
 OTHER DIRECT COSTS (COC'S) INCLUDE G&A, and ALL FEES
 CONFIDENTIAL INFORMATION DO NOT QUOTE, CITE, OR DUPLICATE

DATE: 06/26/87
PAGE: 1

UAF 136-3LP5 GREENWOOD CHEMICAL
AMENDMENT# 002 ONLY

LABOR WORKHOUR BREAKDOWN TABLES

TASK / DESCRIPTION	P4 P3 P2 P1 T2 T1							TOTAL LOE	CLER HOURS
	HOURS	HOURS	HOURS	HOURS	HOURS	HOURS	HOURS		
14C PRE-SAMPLING ACTIVITIES	10	12	197	19	40			259	
14D GEOPHYSICAL SURVEYING	69	177	126	126	130	120		639	
14E INTERIM FIELD SAMPLING-PHASE I	42	36	328	126	126			658	
14F POST SAMPLING ACTIVITIES-PHASE I	16	8	73	173				270	
14G INTERIM FIELD SAMPLING-PHASE II	2		176	50	54			282	
14H POST SAMPLING ACTIVITIES-PHASE II	16	8	47	76				147	
TASK TOTAL -->	155	241	945	444	350	120		2255	
TOTAL	155	241	945	444	350	120		2255	

WESTON GEOPHYSICAL

WA# 136-3LP5 GREENWOOD CHEMICAL
 AMENDMENT# 002 ONLY

COST/RESOURCE INPUT VALIDATION REPORT

		-----LABOR HOURS-----										TRAVEL/LIVING										MISC										FIELD GEOPHS									
CC	AND TSK	P4	P3	P2	P1	T2	T1	SECL	COMP	REGN	POST	TELE	REPORT	REPRO	SUPL	OTHER	SUPT	MAINT	PC	SAMPLE	EQUIP	EQUIP	EQUIP	SUPT	LAB	SERV	LAB	MOBILE	SUB	POOL											
09	002 140	45	157	116	19	130	120																																		

UA# 136-3LP5 GREENWOOD CHEMICAL
AMENDMENT# 002 ONLY

COST/RESOURCE INPUT VALIDATION REPORT

*****LABOR*****	TRAVEL/LIVING	POST	TELE	REPORT	REPRO	SUPL	MISC	TECH	WAFINE	PC	FIELD	GEOGRS	H & S	SUPT	LAB	MOBILE	SUR
C AND TSK P4 P3 P2 P1 T2 T1 SECL COMP REGN											SAMPLE	EQUIP	EQUIP	EQUIP	SERV	LAB	POOL

155	241	945	444	350	120	16412	775	1885	400	9480	7035	3674	4800
-----	-----	-----	-----	-----	-----	-------	-----	------	-----	------	------	------	------

DATE: 08/26/87
PAGE: 3

**SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR REM III
HAZARDOUS WASTE SITE ACTIVITIES**

SITE: GREENWOOD CHEMICAL

LOCATION: NEWTOWN, ALBEMARLE COUNTY,
VIRGINIA

DATE PREPARED: JULY 29, 1987

PREPARED BY: JOSEPH L. SBARRA/EBASCO
(NAME/COMPANY)

PLANNED SITE ACTIVITY DATES: AUGUST 31, 1987 - OCTOBER 3, 1987
(approximate)

REVISION: 0

EBASCO SERVICES INCORPORATED, EBASCO SUBCONTRACTORS AND THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE HAZARDOUS NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

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III	Site History and Physical Description	4
IV	Site-Related Incidents, Complaints, and Actions	7
V	Waste Description/Characterization	8
VI	Hazard Assessment	9
VII	Training Requirements	10
VIII	Zones, Personnel Protection and Communication	12
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X	Safety Considerations for Site Operations	18
XI	Decontamination Procedures	20
XII	Additional Work Practices	24
XIII	Disposal Procedures	24
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SECTION I: GENERAL

This plan has been prepared in conformance to REM III Program Guideline HS-1.01. It addresses all those activities associated with the sampling plan development at the Greenwood Chemical site and will be implemented by the HSO during site work. Compliance with this HASP is required of all persons and third parties who enter this site. Assistance in implementing this Plan can be obtained from the REM III Health and Safety Manager (HSM), and/or the Ebasco Company Health and Safety Supervisor (CHSS). The content of this HASP may change or undergo revision based upon additional information made available to health and safety (H&S) personnel, monitoring results or changes in the technical scope of work. Any changes proposed must be reviewed by H&S staff and are subject to approval of the Ebasco CHSS, and the HSM.

SITE Greenwood Chemical SITE NO. 4236.557

PLAN DATE _____

SCOPE OF WORK Development of Sampling Plan

	<u>SITE MANAGER</u>	<u>HEALTH AND SAFETY OFFICER</u>
NAME	<u>John Gorgol</u>	<u>Joe Sbarra</u>
WORK PHONE	<u>(201) 460-6313</u>	<u>(201) 460-6301</u>

EMERGENCY PHONE NUMBERS

<u>Albemarle</u>	<u>Police Dept.</u>	<u>911</u>
<u>Crozet Volunteer</u>	<u>Fire Dept.</u>	<u>911</u>
<u>W. Albemarle</u>		
<u>Volunteer</u>	<u>Rescue Service</u>	<u>911</u>
<u>University of</u>	<u>Hospital</u>	<u>(804) 924-0311</u>
<u>Virginia</u>		
<u>Martha Jefferson</u>	<u>Back-up Hospital</u>	<u>(804) 293-0111</u>
	<u>National Response Center</u>	<u>(800) 424-8802</u>
	<u>Poison Control Center</u>	<u>911</u>
<u>Steve Schaffer</u>	<u>CHSS</u>	<u>(201) 460-6501</u>
<u>Dick Evans</u>	<u>REM III Regional Manager</u>	<u>(215) 752-0212</u>
<u>Joe Valdes</u>	<u>Field Operations Leader</u>	<u>(201) 460-6028</u>
	<u>REM III HSM (G. Smith or</u>	
	<u>J. Janous)</u>	<u>(703) 558-7506</u>
<u>Carrie Dietzel</u>	<u>Community Relations</u>	
	<u>Coordinator</u>	<u>(215) 752-0212</u>
	<u>Off-site Emergency Services</u>	
	<u>Site Command Post</u>	

SECTION II: HEALTH AND SAFETY PERSONNEL

2.0 Health and Safety Personnel Designations

The following briefly describes the health and safety designations and general responsibilities which may be employed for the Greenwood Chemical site.

2.1 Company Health and Safety Supervisor

The CHSS has overall responsibility for development and implementation of this HASP. He also shall approve any changes to this plan due to modification of procedures or newly proposed site activities.

The CHSS will be responsible for the development of new company safety protocols and procedures necessary for field operations and will also be responsible for the resolution of any outstanding safety issues which arise during the conduct of site work. Health and safety-related duties and responsibilities will be assigned only to qualified individuals by the Ebasco CHSS. Before personnel may work on-site, currentness of acceptable medical examination and acceptability of health and safety training must be approved by the CHSS.

2.2 Site Health and Safety Officer

The HSO will be present on-site during the conduct of all level A, or B, or high-hazard level C field operations and will be responsible for all health and safety activities and the delegation of duties to the H&S staff in the field. Where the site is identified as low-hazard level C or level D, the HSO may direct the site health and safety efforts through an assistant health and safety officer approved by the CHSS. The assistant will be responsible for implementation of the HASP. He may direct or participate in downrange activities as appropriate when this does not interfere with his primary HSO responsibility. The HSO has stop-work authorization which he will execute upon his determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations, such as detrimental weather conditions. Authorization to proceed with work will be issued by the CHSS after such action. The HSO will initiate and execute all contact with support facilities and personnel when this action is appropriate.

2.3 Assistant Health and Safety Officer

An Assistant HSO may be designated. On low-hazard level C or level D site he may have collateral duties but must be qualified for the health and safety responsibility by the CHSS. At level A, B or high-hazard level C sites, he will be the down range person who accompanies field sampling teams and will report to the HSO. Additionally, he may be required to support the HSO when multiple operations are conducted that require monitoring and HSO surveillance. His primary responsibility is to provide the appropriate monitoring to ensure the safe conduct of field operations. He will have access to continuous communications with the Command Post. The number of Assistant HSO's will be dependent upon the number of downrange operations occurring simultaneously, site level of protection designation, and the individual assignments made by the HSO. The Assistant HSO will also share responsibility with the Field Operations Lead and the HSO for ensuring that all safety practices are utilized by downrange teams and that during emergency situations appropriate procedures are immediately and effectively initiated. He will also be responsible for the control of specific field operations and all related activities such as personnel decontamination, monitoring of worker heat or cold stress, distribution of safety equipment, and conformance with all other procedures established by the HASP.

2.4 Air Monitoring Specialist

The Air Monitoring Specialist, if needed, will perform all supplemental air monitoring necessary to support specific activities as required by the HASP. These activities will include operations where special problems exist, extensive instrumentation is required, or particularly complex operations are planned. He will provide consultation to the project team where such services are necessary to ensure that appropriate monitoring, calibration, and maintenance procedures are employed. This will include specification as to type of instrumentation and procedures to be employed to make sure of its proper use.

SECTION III: SITE HISTORY AND PHYSICAL DESCRIPTION

3.1 Location (See Figure 3-1)

The Greenwood Chemical site is located near Newtown, Virginia about 12 miles west of the city of Charlottesville. The site covers approximately 18 acres and is bordered by Interstate 64 and a service road to the north, by a local playground and a softball field and by Route 690 to the west, by an abandoned cattle farm to the south, and field/forest area to the east. The map coordinates are 38°02'38.9" north latitude and 78°46'4.6" west longitude.

3.2 Description (See Figure 3-2)

The site contains manufacturing buildings and 5 active lagoons. Several rusting, but intact drums have been discarded along the banks of the lagoons. Approximately 400 drums are known to be buried at the site.

Geologically the site is underlain by a fractured granite or gneiss bedrock aquifer. Site topography slopes eastward with primary surface drainage controlled by the diversion ditches that crisscross the property. The ultimate destination of surface water flow, via a small tributary located 2,000 ft. south of the facility, is Stockton Creek. Stockton Creek flows into the Meechum River. Meechum River is contiguous with the Rivanna River which supplies the potable water for the city of Charlottesville.

Directly west of the lagoons, just off the access road, is a 200' x 50' area where approximately 400 drums have been buried. The area is sparsely vegetated with patches devoid of growth.

3.3 History

The Greenwood Chemical Company was opened in 1947 by owner F.O. Cockerville to manufacture speciality chemicals. In 1969, F.O. Cockerville sold Greenwood Chemical because he had developed increasing health problems which he allegedly attributed to chemical exposures from the plant. In 1977, Albert Cereghino purchased Greenwood Chemical and is currently still the owner.

From 1947-1985 Greenwood Chemical manufactured speciality chemicals for the industrial, pesticide, and pharmaceutical trades. Greenwood Chemical also allegedly manufactured military gases. In May of 1985, production ceased following a toluene explosion that killed 4 workers.

SITE MAP
GREENWOOD CHEMICAL

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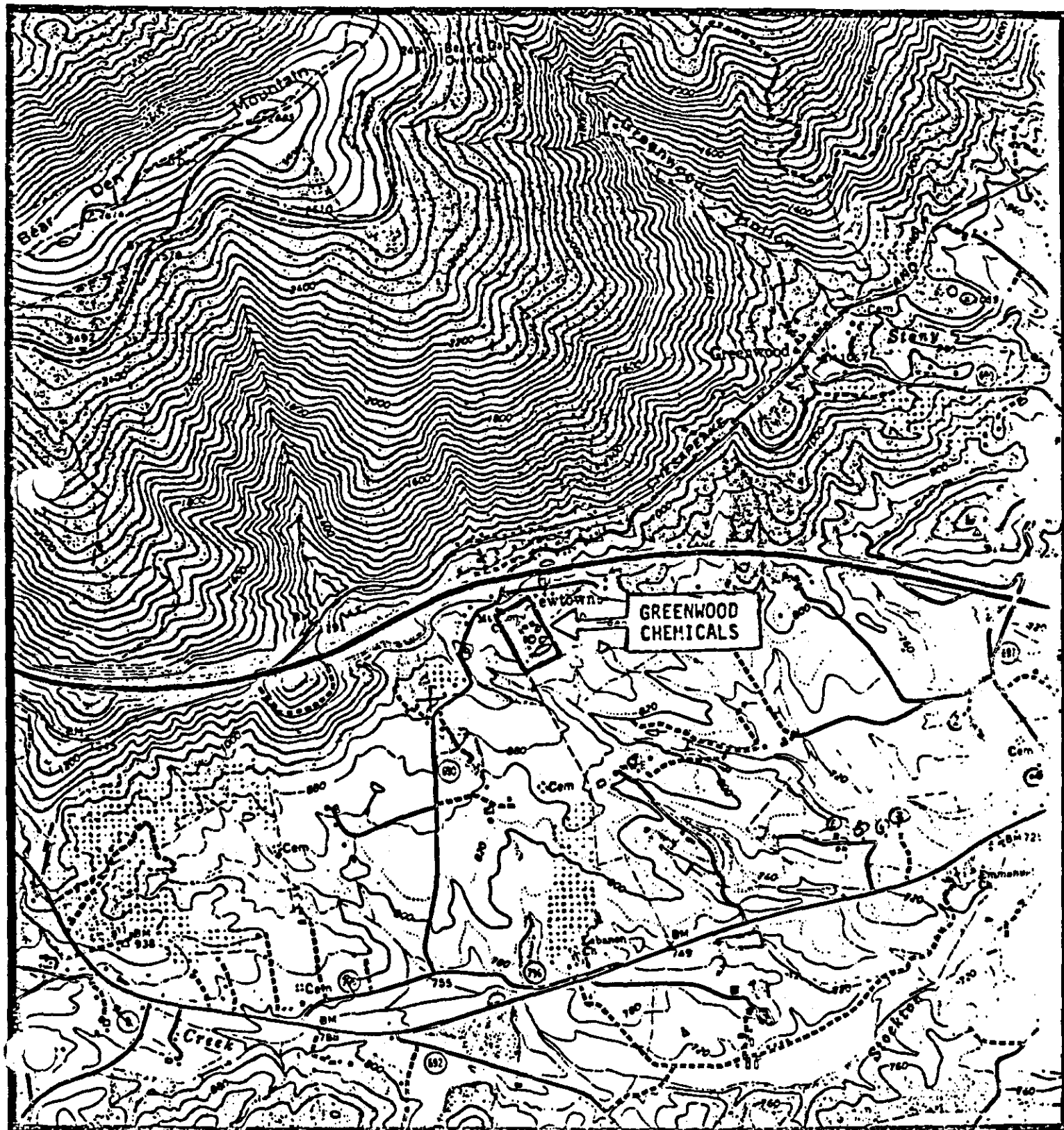


FIGURE 3-1

300095

SITE MAP
GREENWOOD CHEMICAL

Page 6 of 37

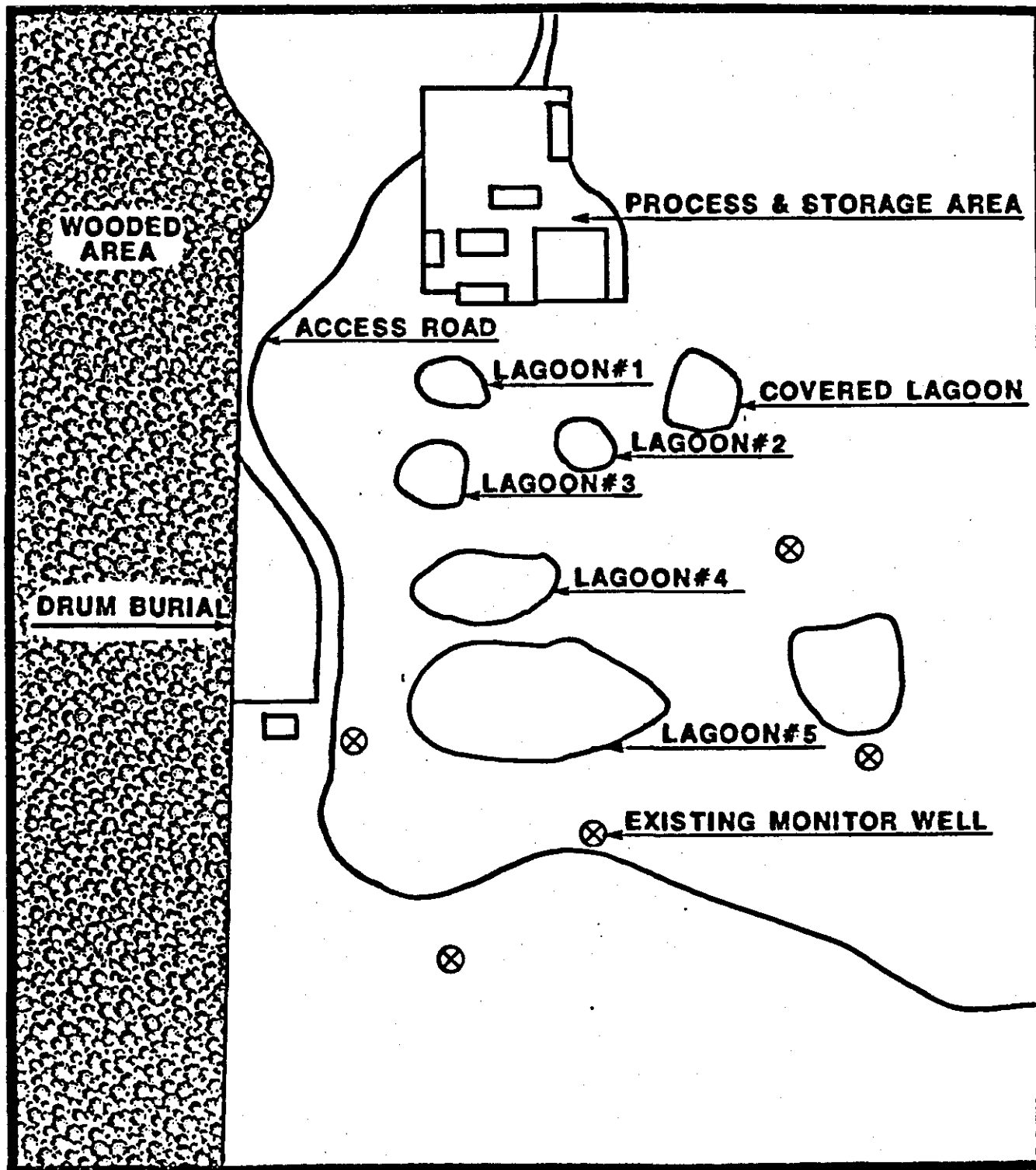


FIGURE 3-2

NOT TO SCALE

⊗ MONITORING WELL CLUSTER

300096

SECTION IV: SITE RELATED INCIDENTS, COMPLAINTS, AND ACTIONS

In July of 1971 a fish kill occurred in Stockton Creek. It is suspected that the overflow from the lagoons, after a heavy rain, was carried via a small tributary located 2000 ft. south of the plant into the Stockton Creek. Samples taken by the Virginia State Wastes Control Board were very high in nitrates and alkalinity.

Sometime during 1975 a cattle kill occurred at the farm immediately south of the plant. It is again suspected that overflow from the lagoons after a rainstorm caused the kill.

Greenwood Chemical has had a long history of employee complaints and OSHA safety violations.

On July 27, 1982, a consulting firm named Ecology and Environment, Inc., conducted a desktop Preliminary Assessment for a potential hazardous waste site for Greenwood Chemical based on Virginia Department of Health (VDOH) inspections from 1978 to 1979. The report recommended that no further action be taken regarding Greenwood Chemical in the EPA Hazardous Waste Site Program.

On April 18, 1985 a toluene fire/explosion occurred that killed four workers. Water was accidentally added to a vat containing toluene and naphthoic acid, causing it to boil over. The electrical system was shut down; in spite of that an unknown ignition source occurred that triggered an explosion and subsequent fire.

On May 15, 1985 the VDOH conducted a Preliminary Assessment for a Potential Hazardous Waste site. Because readings as high as 5 PPM in the breathing zone were obtained and because of the condition of the site, the VDOH requested that a high priority site investigation be conducted.

On November 13, 1985, the VDOH conducted a Hazard Ranking System evaluation for the Greenwood Chemical site and it was subsequently placed by the EPA in the National Priorities List of hazardous waste sites.

From March 12, 1987 to March 17, 1987 Enviresponse collected soil and monitoring well samples at Greenwood Chemical. From March 18, 1987 to March 20, 1987 ERT/TAT was present at Greenwood Chemical and provided head space analysis of soil samples and monitoring well water samples. All head space analysis results were below 1 PPM for organic contaminants except for one monitoring well sample which was 1.1 PPM of toluene.

SECTION V: WASTE DESCRIPTION/CHARACTERIZATION

5.1 The following information is presented in order to identify the types of materials that may be encountered at the Greenwood Chemical site. The detailed information on these materials was obtained from the Condensed Chemical Dictionary - Hawley, Dangerous Properties of Industrial Materials - Sax, and the NFPA Fire Protection Guide on Hazardous Materials.

5.2 CERCLA Hazard Rating Definitions

<u>Substance</u>	<u>Toxicity</u>	<u>Ignitability</u>	<u>Reactivity</u>	<u>Persistence</u>
aldrin	high	non-flammable	stable	high
anthracene	high	low	stable	moderate
arsenic	high	non-flammable	stable	high
benzene	high	high	stable	low
chlorobenzene	moderate-low	moderate	stable	moderate
cyanide	high	non-flammable	stable	high
dieldrin	high	non-flammable	stable	high
diethylamine	moderate	high	stable	moderate
heptachlor epoxide	high	non-flammable	stable	high
isophorone	moderate	low	stable	moderate
methylene chloride	high	high	stable	moderate
napthalene	high	low	stable	low
nitrobenzene	high-moderate	low	stable	moderate
pentachlorophenol	high	non-flammable	stable	high
phenol	high	non-flammable	stable	low
pyridine	moderate	moderate	stable	moderate
tetra-chloroethylene	high	low	stable	moderate
toluene	high	high	stable	low

5.3 Waste Types: Liquid X Solid _____ Gas _____
 Sludge X Semi-solid X Other _____

5.4 Characteristics: Corrosive _____ Flammable X
 Explosive _____ Volatile X
 Radioactive _____ Inert _____
 Other _____

5.5 Containment: Pit _____ Pond _____ Lagoon X
 Lake _____ Process Vessel _____
 Tank _____ Piping _____ Drum _____
 Tank Car _____ Lab Pack _____
 Other X

5.6 Description of "Other" found in 5.3, 5.4 and 5.5.

Some of the contaminants identified were from soil samples taken over a drum burial area and from a lagoon that has been backfilled.

SECTION VI: HAZARD ASSESSMENT

The chemical contaminants listed in Section 5.2 were found in soil and sediment samples or are suspected to be on-site and can be grouped into four major classes:

Volatile Organics

benzene
chlorobenzene
methylene chloride
tetrachloroethylene
toluene

Pesticides

aldrin
dieldrin
heptachlor epoxide

Semivolatile

anthracene
diethylamine
isophorone
naphthalene
nitrobenzene
pentachlorophenol
phenol
pyridine

Metals, Cyanide

arsenic
cyanide (total)

Exposure to volatile organics in general can occur through ingestion, skin absorption, and inhalation. Ingestion as a route of exposure is not anticipated and will be avoided through basic hygiene practices. Skin absorption is likely to occur during lagoon sampling and sample handling; this will be avoided through the use personal protective equipment such as disposable coveralls, gloves, and safety goggles. Inhalation may occur during lagoon and soil sampling and during equipment decontamination; this will be avoided through the use of respiratory protection. Benzene, methylene chloride, and tetrachloroethylene are suspected human carcinogens.

Exposure to semi-volatile organics in general can occur through ingestion, skin absorption, and inhalation. Ingestion as a route of exposure is not anticipated and will be avoided through basic hygiene practices. Skin absorption is likely to occur during lagoon and soil sampling, also during sample handling and equipment decontamination, this route of exposure will be avoided through the use of personal protective equipment such as disposable coveralls, chemical protective gloves and boots, and safety goggles. Inhalation may occur during lagoon and soil sampling and during equipment decontamination; this route of exposure will be avoided through the use of respiratory protection. Many of the semi-volatiles indicated above are skin and eye irritants. Pentachlorophenol and phenol are suspected human carcinogens.

Exposure to arsenic and to cyanide salts can occur through ingestion and inhalation. Ingestion as a route of exposure is not anticipated and will be avoided through basic hygiene practices. Inhalation may occur during soil sampling if dry

SECTION VI: HAZARD ASSESSMENT

and dusty conditions exist but is not likely; should those conditions exist, proper respiratory protection will be selected. Arsenic is a known human carcinogen.

Exposure to the pesticides identified can occur through ingestion, skin absorption, and inhalation. Ingestion as a route of exposure is not anticipated and will be avoided through basic hygiene practices. Skin absorption could occur during lagoon and soil sampling and during sample handling; this route of exposure will be avoided through the use of personal protective equipment such as disposable coveralls, chemical protective gloves and boots, and safety goggles. Inhalation might occur, but is not likely, unless dry and windy conditions exist during soil sampling; this route of exposure will be avoided through the use of respiratory protection. Aldrin, dieldrin, and heptachlor epoxide are suspected human carcinogens.

Heat stress could be a problem during the summer months especially if Tyvek suits are worn. The effects of heat stress range from mild symptoms, such as fatigue or irritability, to severe symptoms such as unconsciousness or death. Appropriate work/rest regimens, showers, and drinking liquids should be used in order to prevent heat stress.

SECTION VII: TRAINING

7.0 Basic Training Required

Completion of the REM III Fundamental Health and Safety Training or the approved equivalent is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Training or training and site experience must also conform to the requirements of 29 CFR 1910.120.

7.1 Advanced Training

Advanced Training as necessary will be provided to any personnel who will be expected to perform site work utilizing Level A protection or other specialized operation to be undertaken at a site. An Emergency Response Team shall be formed and trained to carry out Level A work.

7.2 Site-Specific Training

Training will be provided that will specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

7.3 Safety Briefings

Project personnel will be given briefings by the HSO or Assistant HSO on a daily or as needed basis to further assist site personnel in conducting their activities safely. It will be provided when new operations are to be conducted, changes in work practices must be implemented due to new information made available, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices when performance deficiencies are identified during routine daily activities or as a result of safety audits.

7.4 First Aid and CPR

The CHSS will identify those individuals requiring this training in order to ensure emergency treatment is available at field activities. It is expected that the selected number of field workers will have First Aid training and several members of the field team will have CPR training. These courses will be consistent with the requirements of the American Red Cross Association.

SECTION VIII: ZONES, PROTECTION, AND COMMUNICATION**8.1 SITE ZONES**

Ebasco employs a three zone approach to site operations to control the potential spread of contamination from the site. The three zones include the Exclusion Zone, the Contamination Reduction Zone (CRZ) and the Support Zone. The locations for the site zones will be in the immediate area of the individual tasks (i.e. - drilling and will be determined during surveying).

8.1.1 Exclusion Zone

The area(s) which contains, or is suspect of containing, hazardous materials will be considered the Exclusion Zone. This zone is to be clearly delineated by a "Hotline." The HSO may establish more than one restricted area within the Exclusion Zone when different levels of protection may be employed or different hazards exist. No personnel are allowed in the Exclusion Zone without: 1) a buddy, 2) the proper personal protective equipment, 3) medical authorization, and 4) training certification.

8.1.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the Exclusion Zone and the Support Zone. The CRZ will contain the contamination reduction corridor (CRC) and will provide for full personnel and portable equipment decontamination. The Contamination Reduction Zone is to be used for general site entry and egress in addition to access for heavy equipment for investigation activities. The CRZ will also contain appropriate safety and emergency equipment such as an emergency eyewash, fire extinguisher, stretcher, and first aid kit.

8.1.3 Support Zone

The Support Zone is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line." It will contain the Command Post which will provide for team communications and emergency response. Appropriate sanitary facilities, safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The Command Post should be located upwind of site operations if possible and could be used as a potential evacuation point. No potentially contaminated personnel or materials are allowed in this zone except appropriately packaged/decontaminated and labeled samples. Meteorological conditions should be observed and noted from this zone, as well as those factors pertinent to heat and cold stress.

SECTION VIII: ZONES, PROTECTION, AND COMMUNICATION

8.2 PERSONAL PROTECTION8.2.1 General

The level of protection to be used by field personnel will be defined and controlled by the HSO with approval of the CHSS. Basic levels of protection for general operations are outlined in the REM III Personal Protection Guidelines HS-2. Where more than one hazard area is indicated, further definition shall be provided by review of site hazards, conditions, and proposed operational requirements and by monitoring at the particular operation being conducted. Protection may be upgraded or downgraded, as appropriate, only after the HSO receives authorization from the Ebasco CHSS.

<u>Task</u>	<u>Level of Protection</u>	
	<u>Respiratory</u>	<u>Clothing</u>
<u>Sampling Reconnaissance</u>	D	D
<u>Surveying Operations</u>	D	D
<u>Geophysical Survey/Screening</u>	D	D
<u>Surface Water/Sediment Sampling</u>	D/C	C
<u>Surface Soil Sampling</u>	D/C	C
<u>Lagoon Sampling</u>	B/C/D	C
<u>Decontamination (CRC)</u>	D	D
<u>Decontamination of Heavy Equipment</u>	C	C
<u>Decontamination of Sampling Equipment</u>	D/C	D
<u>General Clean Area Work</u>	D	D

8.2.2 Personnel Protective Equipment

The following generally describes the equipment that comprises the various levels of protection indicated. For specific site conditions or work tasks, modifications or alterations for each of these levels may be necessary. These minor changes will be implemented by the Ebasco HSO as necessary.

A) Respiratory Protection

- 1) Level B - Air supplied respirator (supplied by Ebasco)
- 2) Level C - Full Face Air Purifying respirator with combination Dust Filter (HEPA) and organic vapor cartridge.
- 3) Level D - No respirator will be worn. Certain operations may require a face shield, or a respirator be carried on personnel.

SECTION VIII: ZONES, PROTECTION, AND COMMUNICATION

B) Clothing

1) Level C Protective Clothing:

- o Chemical protective suit (e.g., polycoated Tyvek);
- o Coveralls;
- o Gloves, inner (surgical type);
- o Gloves, outer (chemical protective);
- o Boots (chemical protective, steel toe);
- o Booties (optional); and
- o Hard hat.

2) Level D Protective Clothing:

- o Coveralls;
- o Gloves (chemical resistant);
- o Boots/shoes (chemical protective, steel toe);
- o Safety glasses;
- o Booties (optional); and
- o Hard hat.

8.2.3 Safety Equipment

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRC, as appropriate. This shall include HASP-specified communications, first aid kit, emergency eyewash or emergency shower or drench system, fire extinguishers, and other safety-related equipment. Also located in the Support Zone or the CRZ will be a backup field team when required to support downrange field teams. The Command Post will be manned during all times when teams are downrange, communications will be maintained, and personnel will be available to assist in decontamination procedures for personnel and equipment. Other safety equipment will be located at the site of specific operations, e.g., a drilling rig, as appropriate.

8.3 COMMUNICATIONS

- . Walkie-Talkies - Hand held units shall be utilized as much as possible by field teams for communication between downrange operations and the Command Post base-station.
- . Telephones - A telephone may be located in the Command Post trailer in the Support Zone for communication with emergency support services/facilities. If not appropriate for a particular project, the nearest public phones shall be identified.

SECTION VIII: ZONES, PROTECTION, AND COMMUNICATION

- . Air Horns - These will be carried by downrange field teams and also will be maintained at the Support Zone for announcing emergency evacuation procedures (see Section XIV) and backup for other forms of communications.
- . Hand signals - To be employed by downrange field teams along with utilizing the buddy system. These signals are also very important when working with heavy equipment. They shall be known by the entire field team before operations commence and covered during site-specific training.

SECTION IX: MONITORING PROCEDURES

9.1 MONITORING DURING SITE OPERATIONS

All site environmental monitoring should be accompanied by meteorological monitoring of appropriate climatic conditions.

9.1.1 Sampling Operations - Monitoring will be performed continuously by the HSO during all sampling operations, including surface water/sediment, surface soil, and lagoon sampling. A photoionization detector (PID) and/or flame ionization detector (FID) equipped organic vapor meter will be used to monitor the breathing zone and all samples upon their retrieval.

9.1.2 Action Levels

<u>Instrument</u>	<u>Action Levels</u>	<u>Level of Respiratory Protection/Action</u>
PID/FID	0-0.2 ppm (TWA)** unknowns above background in BZ	Level D
PID/FID*	0.2-5 ppm (TWA) unknowns above background (Bkg) in BZ (Breathing Zone)	Level C
PID/FID*	5-500 ppm unknowns above Bkg in BZ	Level B
None	No pesticide odor detected by smell	Level D
None	Pesticide odor detected by smell	Level C

*For the FID, concentrations expressed are the "methane equivalent." For the PID, concentrations expressed are the "benzene equivalent."

**Time Weighted Average

SECTION IX: MONITORING PROCEDURES

9.2 PERSONNEL MONITORING PROCEDURES

During the conduct of site operations, personnel monitoring may be performed to establish and document the environment in which field teams have been working. This monitoring will be utilized to comply with the requirements of the REM III Health and Safety Program and with OSHA regulations. Use of cartridge respirators shall be monitored to comply with OSHA and to document compliance with acceptable exposure criteria.

9.3 MEDICAL SURVEILLANCE PROCEDURES FOR EVIDENCE OF PERSONAL EXPOSURE

All REM III personnel and subcontractors who will be performing field work at the Greenwood Chemical Site will be required to have passed a REM III's medical surveillance examination or equivalent. A release for work will be confirmed by the Ebasco CHSS before an employee can begin hazardous activities. The exam will be taken annually at a minimum and upon termination of REM III work. Additional medical testing may be required by the Ebasco CHSS in consultation with the company physician and the HSO if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance.

SECTION X: SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.1 GENERAL

All field sampling will be performed under the level of protection described in Section VIII. In this section all non-monitoring, safety-related procedures will be described for each site operation. Such procedures may include special additional clothing to be worn, respirator specification and modification, special safety equipment such as harnesses and non-sparking tools, need for backup teams, etc.

10.2 SAMPLING RECONNAISSANCE

Safety considerations during the Sampling Reconnaissance are important since this activity will precede all other field operations. The team will maintain line of sight with each other at all times and maintain communications. Monitoring will be performed as indicated in Section IX and will be used to alert the recon team if a dangerous situation exists. It will also assist in prescribing levels of protection for future site operations, designating site layout and identifying areas of particular hazard, if any.

10.3 FIELD SAMPLING OPERATIONS

10.3.1 Lagoon Sampling

All personnel conducting lagoon sampling shall wear the prescribed level of protection. Emergency procedures and the location of all emergency equipment shall be specified by the HSO prior to sampling. Contamination avoidance shall be practiced at all times. Monitoring to establish the required level of protection will be established prior to sampling.

10.3.2 Soil, Surface Water, or Liquid Waste Sampling

Sampling of soils, standing liquids, and other sampling in open areas is addressed here. Personnel shall wear prescribed clothing and eye protection when sampling liquids. Sample bottles should be bagged prior to sampling to ease decontamination procedures. Emergency procedures and the location of all emergency equipment, including spill containment materials shall be specified, prior to sampling. Contamination avoidance shall be practiced at all times. In some situations, such as sampling groundwater wells, additional monitoring may be needed to confirm or establish the required level of protection before the sampling team can proceed.

SECTION X: SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.3.3 Sample Handling

Personnel responsible for the handling of samples shall wear the prescribed level of protection. Samples shall be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions shall be noted. Lab personnel shall be advised of sample hazard level and the potential contaminants present. This can be accomplished when necessary by a phone call to lab coordinator and/or including a written statement with samples. It may be necessary for the H&S staff to review field lab safety procedures for handling site samples to ensure that these practices are appropriate for the type of suspected contaminants in the sample.

10.3.4 Steam Cleaning

All personnel conducting steam cleaning will do so in Level C respiratory protection. All other personnel should be located upwind of this operation. If steam cleaning is performed in an area where the contaminated steam is not contained, then artificial barriers (i.e., tarps) must be utilized to protect personnel both on-site and off-site.

SECTION XI: DECONTAMINATION PROCEDURES

All personnel and equipment exiting the exclusion zone shall be thoroughly decontaminated. Figures 11-1, 11-2, and 11-3 illustrate the decontamination procedures for personnel and portable equipment for the various protection levels indicated in Section VIII. Heavy equipment, if utilized for operations where it may be contaminated, will have prescribed decontamination procedures to prevent hazardous materials from leaving the site. They may include excavating a shallow pit to collect waste cleaning solution and screens, set up if required, to prevent the spread of air contaminants. The pit will be cleaned, wastes disposed of, filled in, and covered with clean soil when its use is terminated. The surface area of the pit shall be sufficient to accommodate the washwater generated by the largest piece of machinery. Equipment needed may include a steam generator with high pressure water, empty containers, screens, screen support structures, and shovels.

LEVEL B DECONTAMINATION PROCEDURES

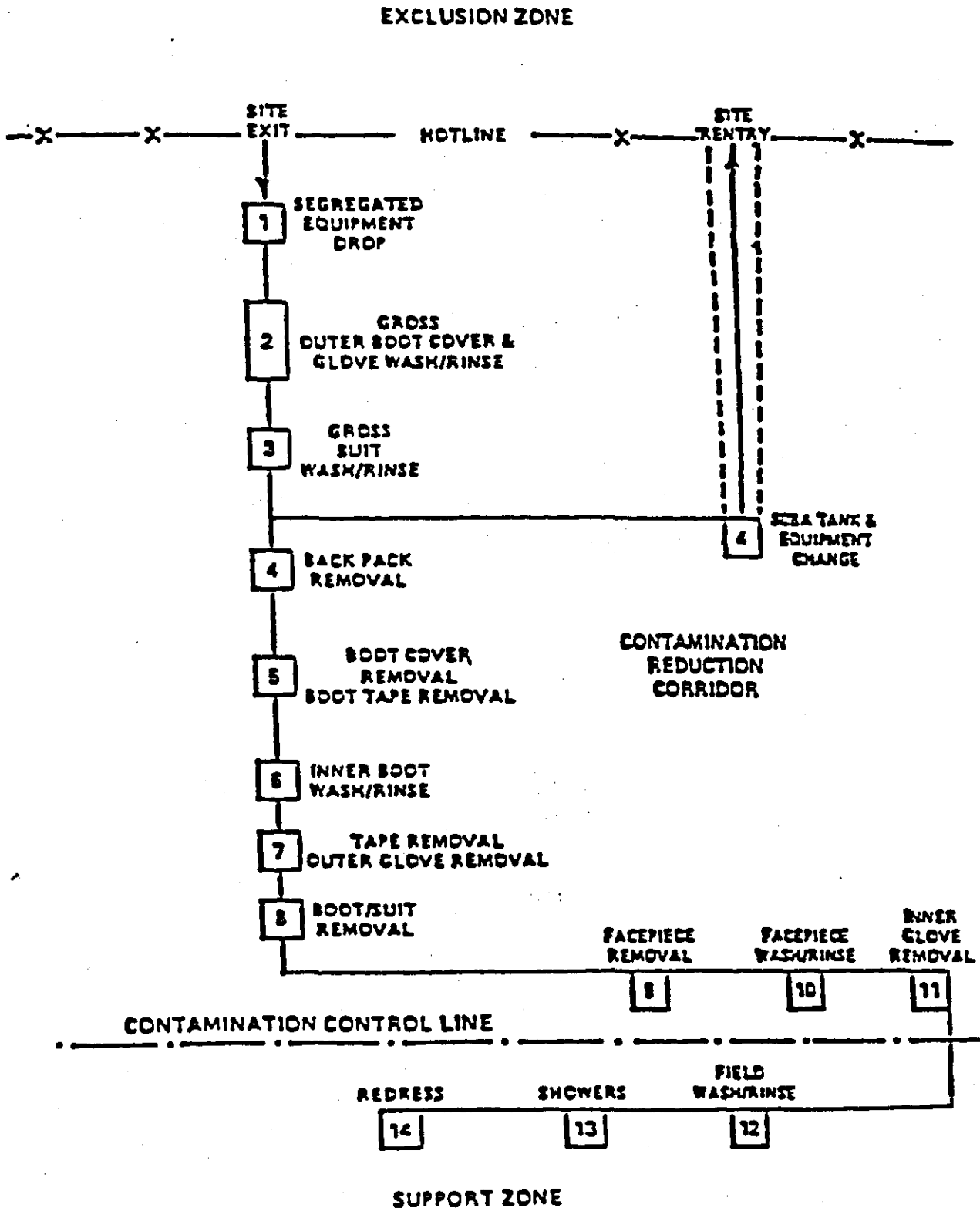


FIGURE 11-1

300111

LEVEL C DECONTAMINATION PROCEDURES

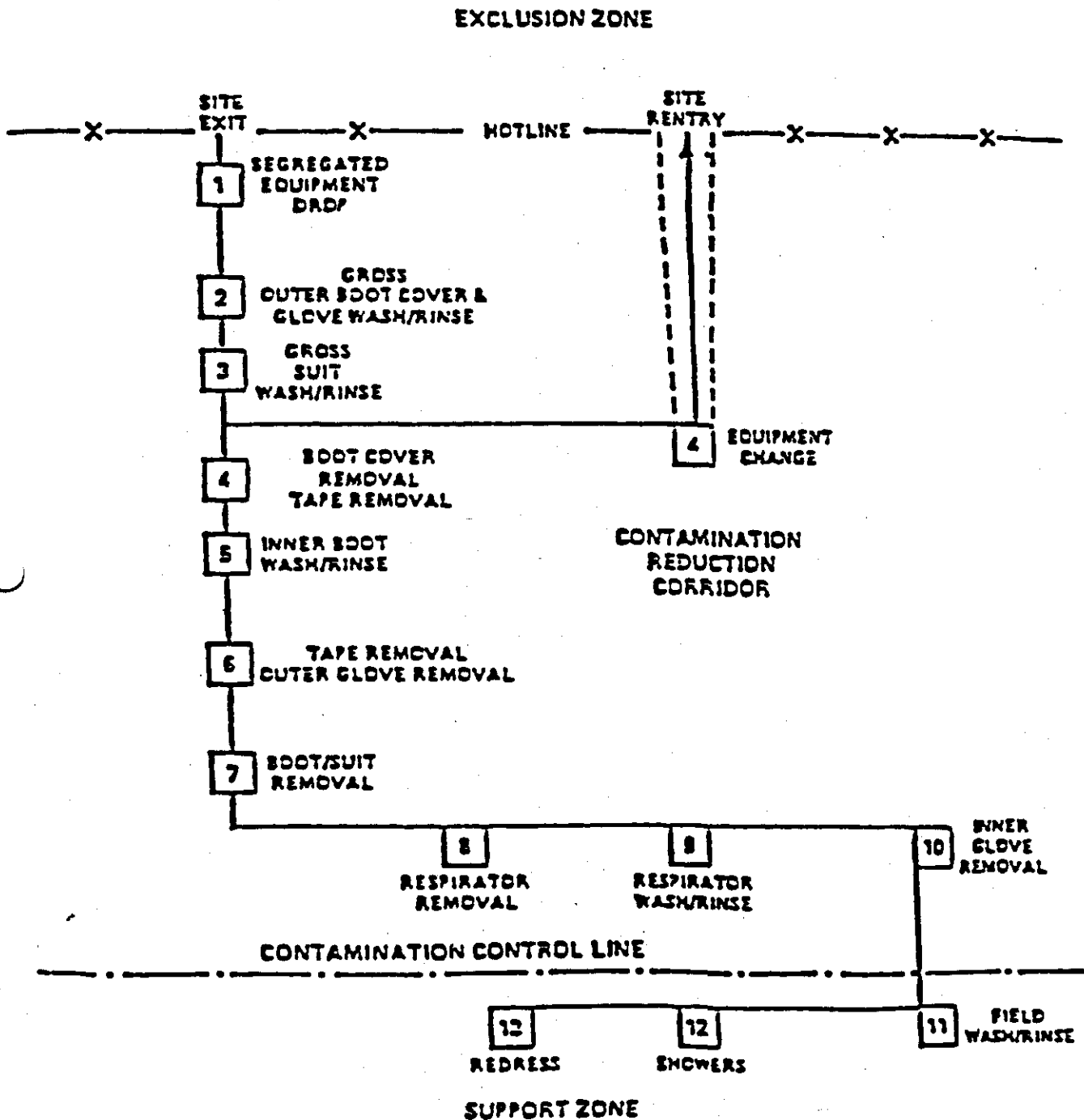


FIGURE 11-2

LEVEL C DECONTAMINATION PROCEDURES

LEVEL D DECONTAMINATION PROCEDURES

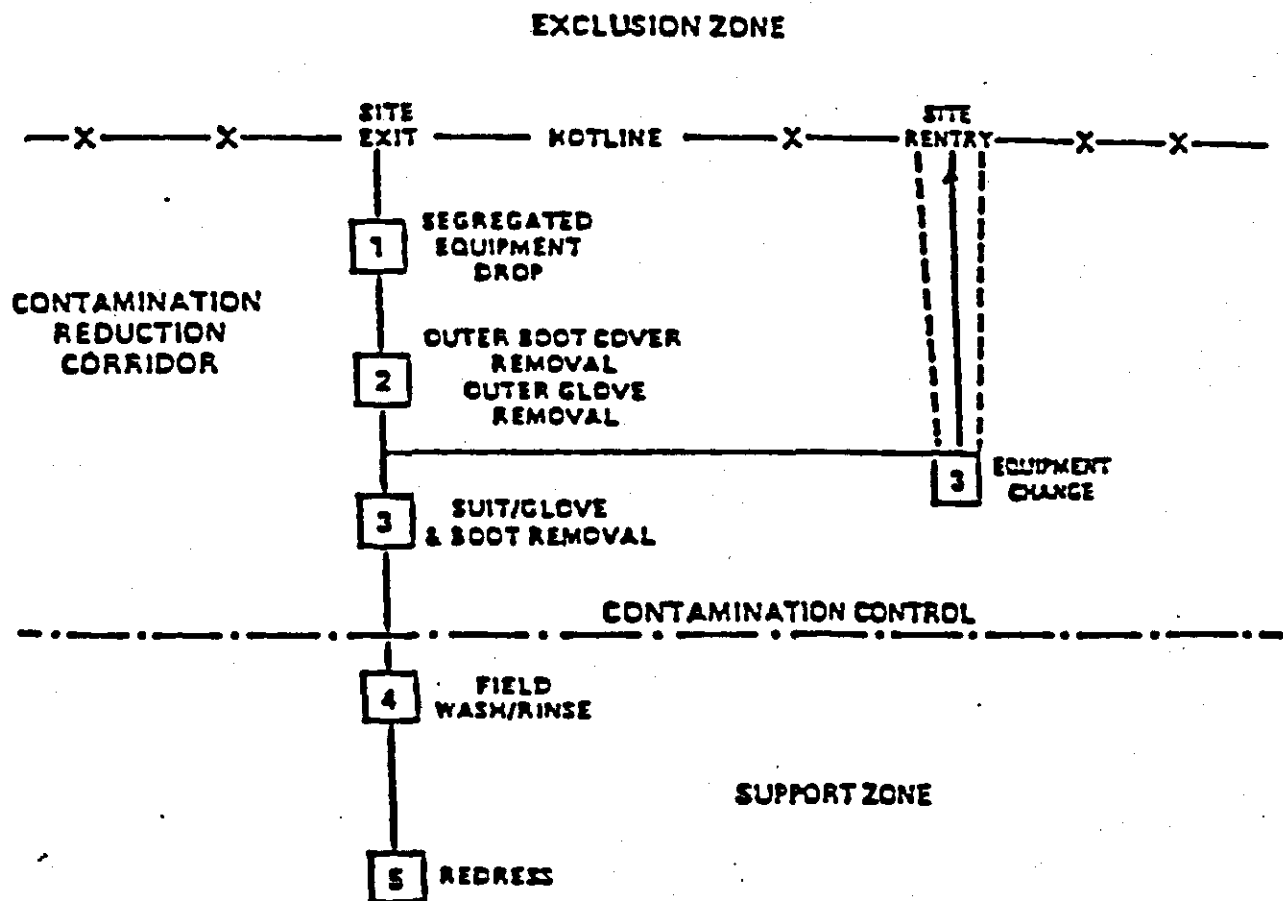


FIGURE 11-3

LEVEL D DECONTAMINATION PROCEDURES

SECTION XII: ADDITIONAL WORK PRACTICES

Refer to Site H&S Officer for specific concerns for each individual site task. Do not climb over/under drums, or other obstacles and always employ the buddy system. Practice contamination avoidance, on and off-site. Activities should be planned ahead of time. Apply immediate first aid to any and all cuts, scratches, abrasions, etc. All accidents, no matter how minor, must be reported immediately to the HSO. Be alert to your own physical condition. Watch your buddy for signs of fatigue, exposure, etc. A work/rest regimen will be initiated when ambient temperatures and protective clothing create a potential heat stress situation. No work will be conducted without adequate natural light or without appropriate supervision. Task safety briefings will be held prior to the onset of task work.

SECTION XIII: DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary and segregated for disposal. All contaminated waste materials shall be disposed of as required by the provisions included in the contract and consistent with REM III and regulatory provisions. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

SECTION XIV: EMERGENCY PLAN

14.0 As a result of the hazards on site, and the conditions under which operations are conducted, the possibility of an emergency situation developing is very real. An emergency plan is required to be available for use at all REM III Sites.

Various individual site characteristics will determine preliminary action to be taken to assure that this emergency plan may be successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment and to the relative possibility of site fire, explosion or release of vapors or gases which will impinge on these neighbors. If there is even a remote possibility of any of these occurrences, the Site Manager must coordinate the neighborhood interface with his Regional Manager, the Community Relations Coordinator, the CHSS and the HSM.

14.1 The Site Emergency Coordinator is:

HSO	<u>Joe Sbarra</u>
Field Operations Leader (Alternate)	<u>Joe Valdes</u>

The emergency coordinator shall make contact with local fire, police and other emergency units prior to beginning work on site. In these contacts the emergency coordinator will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time the emergency coordinator and the emergency response units shall make arrangements to handle any emergencies that might be anticipated.

Contacts have been with the following individuals:

<u>Name</u>	<u>Title</u>	<u>Jurisdiction</u>
Patty Noteman	Dispatcher for Emergency Services	Albemarle County
Dr. Thomas Kuhlman	Medical Director of EMS	Univ. of VA Hospital
Maureen Wellen	Asst VP Program Development	Martha Jefferson Hospital

The emergency coordinator shall implement the contingency plan whenever conditions at the site warrant such action. The coordinator will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate Management staff.

SECTION XIV: EMERGENCY PLAN

14.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of toxic gases, etc.; an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All personnel in both the restricted and nonrestricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the emergency plan. The location shall be upwind of the site as determined by the wind direction indicator. For efficient and safe site evacuation and assessment of the emergency situation, the Emergency Coordinator will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO or Assistant HSO must see that access for emergency equipment is provided and that all combustion apparatus has been shut down once the alarm has been sounded. Once the safety of all personnel is established the Crozet Fire Dept. and other emergency response groups will be notified by telephone of the emergency. The site evacuation plan shall be rehearsed regularly as part of the overall training program for site operations.

14.3 Potential or Actual Fire or Explosion

Immediate evacuation of site (air horn will sound for 10 second intervals) notify local fire and police department, and other appropriate emergency response groups if LEL values are above 25% in the work zone or if an actual fire or explosion has taken place.

Fire Dept. - 911
Police Dept. - 911

14.4 Environmental Incident (Release or Spread of Contamination)

- Control or stop spread of contamination if possible. The emergency coordinator should instruct a person on site to immediately contact local authorities to inform them of the possible or immediate need for neighborhood evacuation. If a significant release has occurred, the National Response Center should then be contacted. This group will alert National or Regional Response Teams as necessary. Following these emergency calls, the reporting individual should then notify the SM, CHSS, RM, and HSM.

SECTION XIV: EMERGENCY PLAN

		PHONE
<u>Crozet Volunteer</u>	Fire Department	<u>911</u>
<u>Albemarle County</u>	Police Department	<u>911</u>
<u>W. Albemarle Volun.</u>	Rescue Service	<u>911</u>
	National Response Center	<u>(800) 424-8802</u>
<u>John Gorgol</u>	SM	<u>(201) 460-6313</u>
<u>Steve Schaffer</u>	CHSS	<u>(201) 460-6501</u>
<u>Dick Evans</u>	RM	<u>(215) 752-0212</u>
<u>John Janous</u>	HSM	<u>(703) 558-7506</u>

14.5 Personnel Injury

Emergency first aid shall be applied onsite as deemed necessary. Then, decontaminate and transport the individual to nearest medical facility if needed. The HSC will supply medical data sheets to appropriate medical personnel and complete the incident report designated in HS-1.12.

Hospital - Primary - University of Virginia Hospital
(804) 924-0311
Back-up - Martha Jefferson Hospital (804)293-0111
 Rescue - 911

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, a hospital route must be firmly identified. During the initial reconnaissance a primary hospital and back-up facility shall be located and route located to and from site with details of the route delineated. A hospital route location map shall be conspicuously posted on site.

Primary Hospital Route:

University of Virginia Hospital
 1400 Jefferson Park Avenue
 Charlottesville, VA 22904

From the site proceed south on Rte. 690 for 1.25 miles until it ends. Turn left onto Rte. 796 east for 1 mile until it ends. Turn left onto Rte. 250 east for 3.5 miles until you reach the I 64 entrance. Get onto I 64 east and continue for 10 miles until you reach exit 22 and take the exit onto Rte 29 north. After 1 mile take the turn-off to the right for Rte 29 bus route. At the first light you come to, turn right onto Fontaine Avenue. After 1 mile Fontaine Avenue turns into Jefferson Park Avenue, continue for 1.5 miles and the hospital will be on your left. Follow signs to the emergency room.

SECTION XIV: EMERGENCY PLAN

Backup Hospital Route:

Martha Jefferson Hospital
459 Locust Avenue
Charlottesville, VA 22901

From the site follow the directions for the primary hospital route and get onto I 64 east. Continue on I 64 east for 12 miles and get off at exit 23. At the end of the exit ramp turn left onto Rte. 631 (Fifth Ridge Street). At the first light, turn right onto Elliot Avenue. Continue for two more traffic lights and turn left onto Avon Street. Continue on Avon Street until a fork is reached and bear right onto High Street. Take your first left onto Locust Avenue and the hospital is on your left side. Follow signs to the emergency room.

14.6 Overt Personnel Exposure

Typical response includes:

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eyewash and emergency shower or drench system will be provided onsite at the CRZ and/or Support Zone as appropriate. Eyes should be rinsed for 15 minutes upon chemical contamination.

INHALATION: Move to fresh air and/or, if necessary decon/transport to hospital.

INGESTION: Decontamination and transport to emergency medical facility.

SECTION XIV: EMERGENCY PLAN

PUNCTURE WOUND

OR LACERATION: Decontaminate and transport to emergency medical facility. HSO will provide medical data sheets to medical personnel as requested (see Section XVI).

Hospital -	<u>Primary - University of Virginia Hospital</u>	<u>(804) 924-0311</u>
	<u>Back-up - Martha Jefferson Hospital</u>	<u>(804) 293-0111</u>
Rescue -	<u>911</u>	

14.7 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- . Potential for heat stress and heat-related injuries
- . Potential for cold stress and cold related injuries
- . Treacherous weather-related working conditions
- . Limited visibility
- . Potential for electrical storms

HOSPITAL ROUTE UNIVERSITY OF VIRGINIA HOSPITAL 1400 JEFFERSON PARK AVENUE CHARLOTTESVILLE

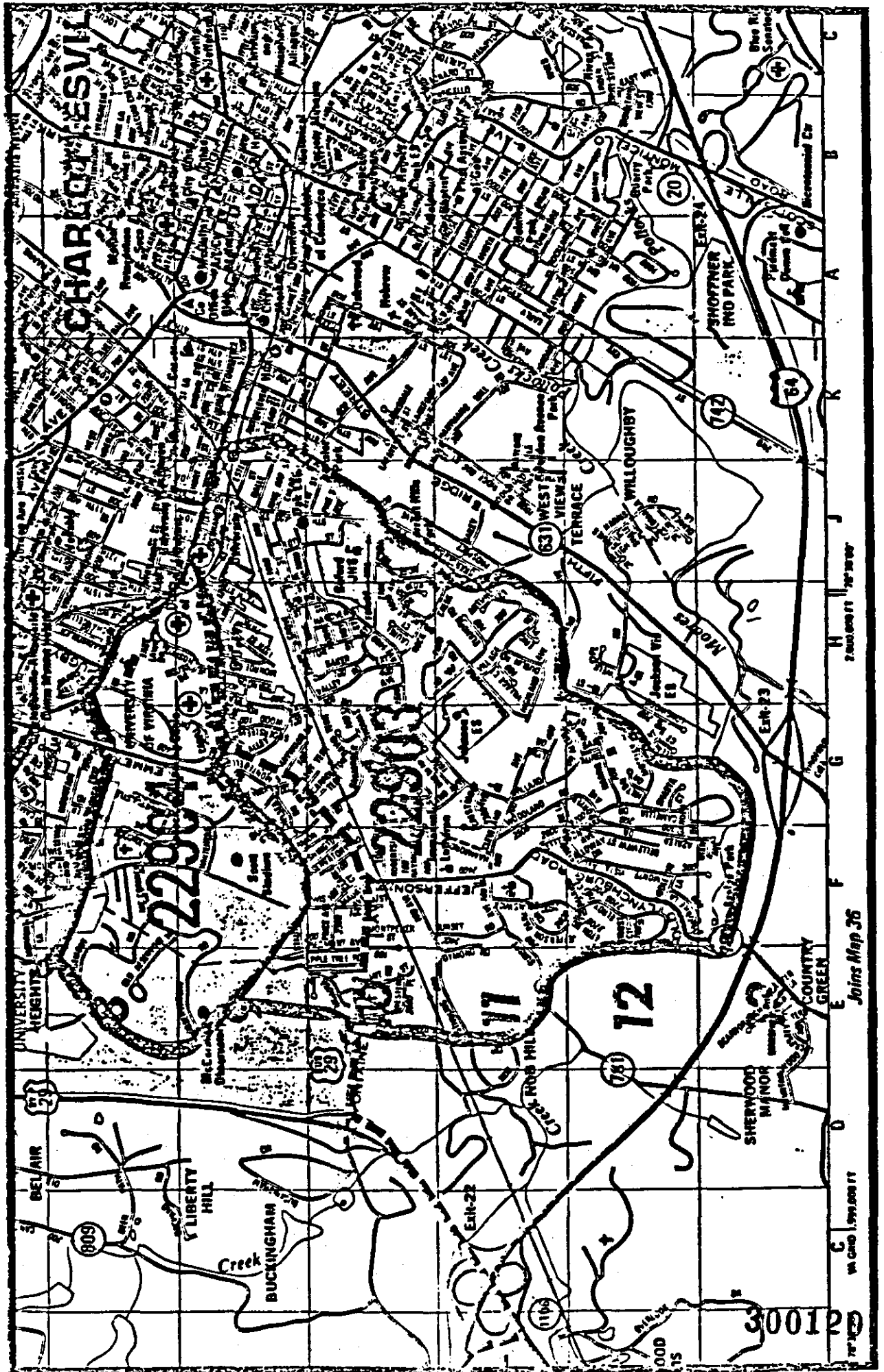
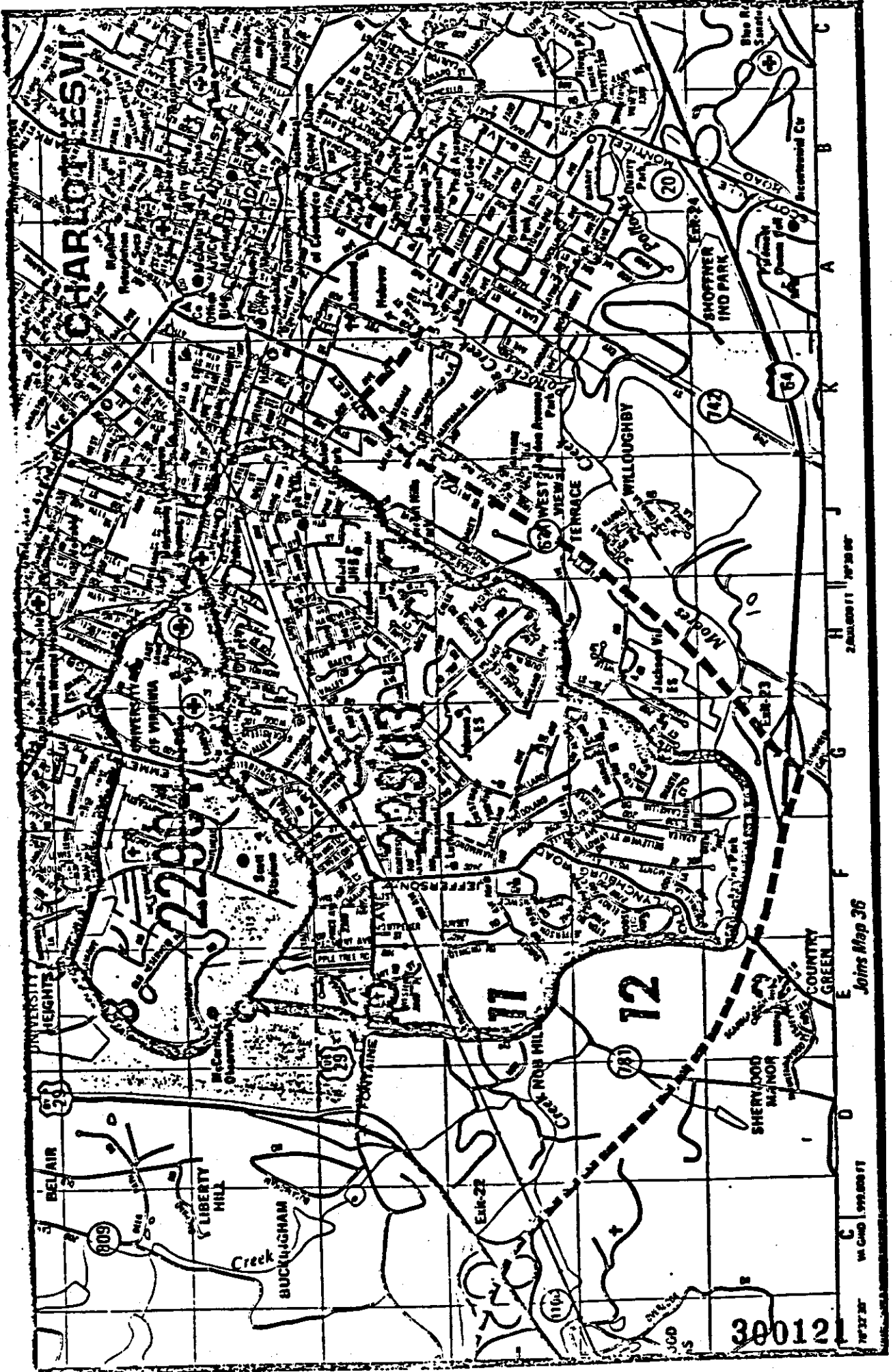


FIGURE 14-1

HOSPITAL ROUTE
 MARTHA JEFFERSON HOSPITAL
 459 LOCUST AVENUE
 CHARLOTTEVILLE



SECTION XV: COMMUNITY RELATIONS

15.0 General

The Greenwood Chemical site is located near Newtown, Virginia about 12 miles west of the city of Charlottesville. The site covers approximately 18 acres and is bordered by Interstate 64 and a service road to the north, by a local playground and a softball field and by Route 690 to the west, by an abandoned cattle farm to the south, and field/forest area to the east. The map coordinates are 38°02'38.9" north latitude and 78°46'4.6" west longitude.

15.1 Project Description

It has been determined through sampling and historical data that the site is contaminated with following chemicals:

Volatile Organics

benzene
chlorobenzene
methylene chloride
tetrachloroethylene
toluene

Pesticides

aldrin
dieldrin
heptachlor epoxide

Semivolatile

anthracene
diethylamine
isophorone
naphthalene
nitrobenzene
pentachlorophenol
phenol
pyridine

Metals, Cyanide

arsenic
cyanide (total)

The site investigation work to be undertaken will include surface water/sediment, surface soil, and lagoon sampling and geophysical surveying. It is anticipated that this investigation will take approximately 4 weeks.

The recommended levels of protection for each task can be found in Section 8.2.1. The levels of protection may be upgraded or downgraded as indicated by monitoring.

Since hazardous material is present, the necessary safety precautions will be implemented. This will include mandating that certain levels of protection be worn by operating personnel and establishing exclusion zones and contamination reduction zones around each sampling location.

15.2 Actions to be Taken

Because of the visibility of the project it is assumed that operations personnel in protective equipment (tyvek, respirators) will attract attention, possibly resulting in

SECTION XV: COMMUNITY RELATIONS

calls to the Town Administration's Office as well as to local police for information. Notifying the local authorities of field operations in advance, particularly off-site field work, will enable them to answer questions that may arise. The Health and Safety officer will brief the operations personnel on project specifics and he, or the Site Manager, will be designated as the "pointman" to which public inquiries are directed. Specific project questions that may arise will be directed when deemed necessary to the primary Ebasco Contact:

John Gorgol, (201) 460-6313 or (215) 752-0212.

SECTION XVI: AUTHORIZATIONS

Personnel authorized to enter the Greenwood Chemical Site while field operations are being conducted must be certified by the Ebasco CHSS. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.10 and review and sign-off of this HASP. All personnel must utilize the buddy system or trained escort, and check in with the Field Team Leader at the Command Post.

1. Ebasco Personnel Authorized to Perform Work On-site:

- | | |
|-------------------------------|-----------------------------------|
| 1. <u>John Gorgol</u> | 11. <u>Joe DiBenedetto</u> |
| 2. <u>John Samuelian</u> | 12. <u>Chrissa Papaioannov</u> |
| 3. <u>Joe Sbarra</u> | 13. <u>Other Ebasco Personnel</u> |
| 4. <u>Joe Valdes</u> | 14. _____ |
| 5. <u>Pat O'Toole</u> | 15. _____ |
| 6. <u>Andrew Patterson</u> | 16. _____ |
| 7. <u>Robert Falotico</u> | 17. _____ |
| 8. <u>Mindy Sayres</u> | 18. _____ |
| 9. <u>Western Geophysical</u> | 19. _____ |
| 10. <u>Personnel</u> | 20. _____ |

17.2 Other Personnel Authorized to Enter Site:

- | | |
|--------------------------------------|-----------|
| 1. <u>ZPMO Personnel</u> | 6. _____ |
| 2. <u>REM III Regional Personnel</u> | 7. _____ |
| 3. <u>EPA Personnel</u> | 8. _____ |
| 4. <u>State Environmental</u> | 9. _____ |
| <u>Personnel</u> | _____ |
| 5. <u>Police, Fire, Emergency</u> | 10. _____ |
| <u>Personnel</u> | _____ |

SECTION XVII: MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all onsite personnel and will be kept in the Command Post during the conduct of site operations. Completion is required in addition to compliance with the Medical Surveillance Program requirements described in the REM III Program Health and Safety Plan. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project Greenwood Chemical

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next of Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses
or Exposures to Hazardous Chemicals _____

What medications are you presently using? _____

Do you have any medical restrictions? _____

Name, Address, and phone number of personal
physician: _____

SECTION XVIII: FIELD TEAM REVIEW

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provisions contained therein.

Site/Project: Greenwood Chemical

[illegible]

SECTION XIX: APPROVALS

By their signature the undersigned certify that this HASP is approved and will be utilized at the Greenwood Chemical site.

Joseph L. Sparr
Health and Safety Officer

7/29/87
DATE

John E. Goyal
Site Manager

7/30/87
DATE

Steven Schaffer/Ed Blid
Company Health and Safety
Supervisor

7/20/87
DATE

Mike O. Mts
Company Designated Lead

7/30/87
DATE

Richard A. Evans
REM III Regional Manager

7/30/87
DATE

John G. Garono
REM III Health and Safety
Manager

07-31-87
DATE